REVISION OF THE GENERA AND TROPICAL AMERICAN SPECIES OF THE SPIDER FAMILY ULOBORIDAE[1]

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ABSTRACT. The cosmopolitan family Uloboridae contains 17 genera, four of which are newly described. Members of five genera construct orb-webs, members of three reduced webs derived from an orb, and members of the remaining genera webs of unknown form. Recognition of 14 synonyms and nine new species brings to 28 the number of known species in the nine uloborid genera found south of the United States (excluding members of the unrevised genus *Miagrammopes*). Scanning electron microscopy shows spiral capture thread to be joined to radii by fine cribellate fibrils and allows more precise identification of male palpal structure, facilitating cladistic analysis of intrafamilial relationship. This analysis shows the simplest of four tracheal patterns to be derived from more extensive patterns. Males of three genera have a newly discovered stridulatory apparatus, consisting of a file on the retrolateral endite surface and two or more picks on the cymbial tip. Uloborids are characterized by having broad, retrolateral patellar notches and a row of trichobothria on each femur. Presence of similar trichobothrial rows in several Araneidae genera indicates close relationship of the two families. Discovery of both haplogyne and entelegyne uloborids challenges the validity of classifying families solely by the degree of genitalic development.

INTRODUCTION

The spider family Uloboridae is represented throughout the world, but achieves its greatest diversity of species and genera in tropical and subtropical zones. Muma and Gertsch (1964) revised the North American members of this family and the present investigation began as a complementary study of the remaining American species and genera. However, it soon became apparent that a clear delineation of American genera required a reexamination of Lehtinen's (1967) comprehensive study of world uloborid genera. Results of this phase of study, while in essential agreement with most of Lehtinen's conclusions, both allowed and demanded a more critical look at uloborid intrafamilial phylogeny. *Miagrammopes* is the only Central or South American genus whose species are not included in this revision. Comprehensive treatment of this important and interesting genus will be presented in a future study.

Olivier described the first uloborid in 1789, placing it (*Zosis geniculatus*) into Linnaeus' genus *Aranea*. The genus *Uloborus* was erected by Latreille in 1806 for *U. walckenaerius* which, because of its orb-web, was allied with Araneidae. Walckenaer described the genus *Uptiotes* (*Hyptiotes*) in 1833 and four years later changed this genus name to *Mithras*, placing it in the family Mithras along with *Scytodes* and *Lycose*. When O. Pickard-Cambridge first described *Miagrammopes* in 1869 he suggested that it was related to *Mithras* and *Uloborus* and that these three genera had "strong affinity with the family Epeirides . . . [but] at present I do not feel sufficiently assured . . . to justify the establishment of a new family of Araneidea, while, at the same time, I confess myself quite unable to include them in any family hitherto-characterized." During the same year Thorell recognized Uloborinae as a subfamily of Epeiroidae (Araneidae). In 1870, O. Pickard-Cambridge established the family Uloborides for the genera *Hyptiotes* and *Uloborus* and the family Miagrammopides for *Miagrammopes thwaitesii* and *M. ferdinandi.* Simon (1874) combined these two families to form Uloboridae and in 1892 extended this family to include the subfamilies Dinopinae (*Dinopis* and *Menneus*), Aebutininae (*Aebutina*), Uloborinae (*Uloborus* and *Sybota*), and Miagrammopinae (*Miagrammopes* and *Hyptiotes*). Pocock (1900) and Dahl (1904) removed the Dictynidae (Aebutininae) and Comstock (1913) the Dinopidae from the family Uloboridae. However, many workers (e.g., Gerhard and Kästner, 1937; Kaston, 1948; Bonnet, 1959) place these three families into the superfamily Dictynoidea. A historical review of higher-level spider classification is presented by Bristowe (1938), Bonnet (1959), and Lehtinen (1967) and need not be repeated here.

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Most disagreement about placement of the Uloboridae centers around the cribellate-ecribellate controversy and a study of the family might be expected to deal at length with this problem i.e., can true spiders be divided into one monophyletic group whose members have a cribellum and another whose members lack this structure. However, I agree with Platnick's (1977) conclusion that the cribellum is a primitive character of all true spiders and that in some groups it has been lost or transformed to a colulus. For this reason attention is devoted to other characters which may prove more useful in studies of relationship.

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It is impossible to acknowledge the many individuals responsible for collecting the thousands of specimens which made this study possible, but their contributions are exemplified by those of Louis Peña of Santiago, Chile. His small collection presented to the Museum of Comparative Zoology contains one new species as well as males and females of two species each known previously from only a single specimen.

METHODS

Specimens from collections were prepared for study with the A.M.R. 1000 scanning electron microscope (SEM) by cleaning them in an ultrasonic cleaner or agitating them in ethanol, dehydrating them in ethanol, and critical-point-drying them in carbon dioxide. Prior to examination, specimens were mounted on double-sided Scotch tape affixed to a SEM stub and then sputter-coated, first with carbon and then with gold-palladium. Specially constructed SEM stubs, each consisting of a 4 mm high, 19 mm diameter, polished aluminum cylinder attached to a 20-mm diameter SEM stub by silver paint were used to collect web samples in the field. Double-sided Scotch tape on the cylinder's 2-mm-wide free rim served to anchor web samples and the 15-mm diameter cut-out tape circle placed on the cylinder's floor provided a nonconducting surface resulting in a black background when webs were studied with the SEM. Web samples were desiccated and sputter-coated (as described above) prior to examination. *Hyptiotes* male palpi were dissected before being critical-point-dried and *Miagrammopes* palpi after being critical-point-dried.

All female genitalia were examined with both a dissecting microscope and a differential interference contrast compound microscope. The female genital region of at least one specimen of each taxon was studied. Some genitalia were removed and optically cleared with and mounted in clove oil. In other cases nonsclerotized tissues were digested with hot 10% (weight/volume) potassium hydroxide and genitalia were then mounted (often *in situ*) in Hoyer's medium. The genital region of *Tangaroa* was studied both after being cleared in clove oil and as its nonsclerotized tissues were slowly eroded by 5% sodium hypochlorite. The latter method permitted study of exposed regions and the small gas bubbles generated by this process allowed examination of the passageway leading from the central spermatheca.

Specimens were prepared for tracheal studies by removing dorsal regions of the carapace and abdomen and digesting nonsclerotized tissues in hot 10% potassium hydroxide. Resulting preparations were first examined with a dissecting microscope in order to study abdominal patterns and then with an interference compound microscope in order to verify these observations and to study cephalothoracic tracheal patterns. In taxa represented by few specimens, tracheal patterns were determined by removing epigyna and carefully separating exposed muscles to determine the number and size of underlying tracheae entering the cephalothorax. Specimens with detached abdomens can be studied in a similar manner. In nearly all taxa tracheal patterns of both males and females were examined and were always found to be similar. Therefore, in the few genera

(*Purumitra*, *Orinomana*, and *Daramuliana*) where male tracheal patterns were not studied (because of lack of specimens), these patterns are most probably similar to those of females.

Webs to be photographed were first dusted with cornstarch (Eberhard, 1976b). Most web measurements were made from enlarged prints of such photographs taken at a carefully recorded distance.

NATURAL HISTORY

Uloborids are often referred to as "hackled-band-orb-weavers," although webs of only half of this family's 16 genera are known and members of only five of these genera (*Waitkera*, *Uloborus*, *Zosis*, *Octonoba*, and *Philoponella*) construct orb-webs. *Polenecia* females produce a vertical, slightly concave web and hang head down at the webs central attachment to a twin support (Wiehle, 1931). To construct this web the spider first lays down 25 to 32 radii, adds a single temporary spiral loop (which remains), and then deposits cribellar silk along the radii and framework threads. *Hyptiotes* also produces an apparently reduced vertical web which takes the form of an orb sector consisting of four radii across which cribellar capture "spirals" extend. *Hyptiotes* web construction and prey capture is discussed by several authors, including Comstock (1913), Gertsch (1949), and Nielsen (1932). Members of the genus *Miagrammopes* construct either a single horizontal capture thread with cribellar silk at its center or a horizontal resting line with one or several vertical or diagonal cribellar capture threads (Akerman, 1932; Lubin *et al.*, 1978).

Uloborid orb-webs are similar in construction to araneid webs. The former employ a cribellate capture spiral and are usually horizontal, whereas the latter have an adhesive capture spiral and are usually vertical. Eberhard (1969, 1971, 1972) discusses the building, structure, and ecology of the orb-web of *Uloborus diversus*. Uloborid cribellate silk consists of two axial (warp or supporting) strands onto which "puffs" of fine cribellate fibrils (Plate 1-F) are combed by the calamistrum (Plate 1-B, C) (Comstock, 1913; Friedrich and Langer, 1969). To accomplish this a spider places the tip of one fourth tarsus on the dorsal surface of the opposite fourth tarsus, bringing the calamistrum adjacent and parallel to the cribellum (Plate 2-A). Both legs are rapidly pumped up and down, combing out fine cribellar silk (with a diameter of about 30 nm and nodes about every 30 to 40 nm along its length, Plate 2-B) and placing it onto the axial threads. As Gerhard and Kästner (1937) and Gertsch (1949) note, this spinning behavior is similar to that of most cribellate spiders. Each pumping motion is presumably responsible for a single hackled-band "puff" as noted by Friedrich and Langer (1969) and Langer and Eberhard (1969). The spider uses the calamistrum of one leg to spin approximately half the cribellate strand spanning adjacent radii and then instantaneously switches to the other calamistrum with no noticeable interruption (Eberhard, 1972; personal observations).

The cribellate spiral threads extend directly across radii, forming a junction that corresponds to Jackson's (1971) "zero"

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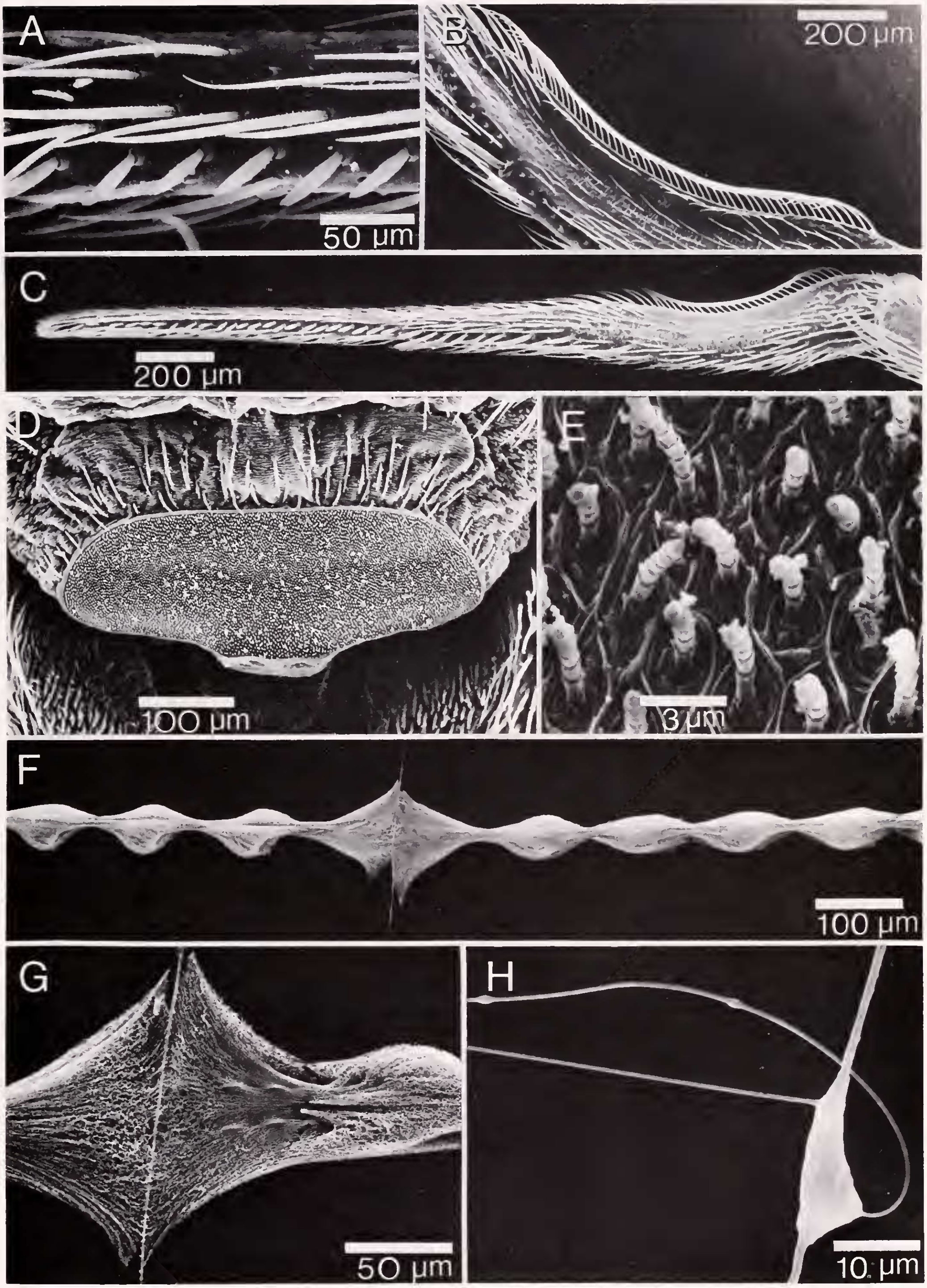
Plate 1. A. Ventral view of *Zosis geniculatus* female fourth tarsus showing erect macrosetae. B. Prolateral view of fourth metatarsus of *Zosis geniculatus* female showing one row of small setae and above it the large setae which form the calamistrum. C. Ventroprolateral view of *Zosis geniculatus* female fourth metatarsus and tarsus showing calamistrum and ventral row of erect macrosetae. D. Cribellum of *Zosis geniculatus* female. E. Spinning spigots of *Philoponella republicana* female cribellum. F. Cribellate silk and spiral-radius junction of *Uloborus penicillatus* female. G. Spiral-radius junction of *Uloborus penicillatus* female. H. Spiral-radius junction of *Mangaroa* sp. female. Horizontal strand is spiral.


A
50 μm
B
200 μm
C
200 μm
D
100 μm
E
3 μm
F
100 μm
G
50 μm
H
10 μm

type (Plate 1-F, G). Eberhard (1976a) has shown that these junctions, in contrast to "nonzero" junctions of araneid orb-webs, do not allow the spiral to slip when it is stretched.

Scanning electron micrographs of *Uloborus penicillatus* (Plate 1-F, G) show the spiral flattened at its junction with the radius and the cribellate fibrils along this junction entangling the radius and responsible for attachment. This is in contrast with the spiral of *Mangaroa* (Plate 1-H) which is attached to the radius by adhesive. It appears that such adhesive junctions allow the spiral to slip through them whereas the entangled junctions of uloborids do not permit this to occur. Eberhard (1976a) has shown that the cribellate mat can pull free of its rigid axial threads, affording the uloborid spiral some elasticity when stressed. This movement may allow prey to come into contact with additional spiral strands. Perhaps the ability of a spiral to easily slide through its radius connections is more important in vertical webs where additional spiral strands wait below to intercept the sagging prey.

Stabilimenta are often added to the web after the capture spiral has been completed and take a variety of forms, none of which appear restricted to a single genus or species. The most common type of stabilimentum seems to be a linear silk band (occasionally two or more) of variable length which extends through the web's hub, usually with a central gap about as long as the spider's body. This type of stabilimentum is found in webs of *U. diversus* (Eberhard, 1969, 1973), *U. glomosus* (Emerton, 1902), *U. plumipes* (Wiehle, 1927), *Philoponella tingena*, and *P. republicana* (personal observations). Some *U. diversus* and *U. penicillatus* add a small spiral of dense silk to the hub of their webs (Eberhard, 1973; personal observation). *Zosis geniculatus* adds either a thin mat of silk to the hub of its web or several delicate, circular silk cogwheels around the perimeter of the hub's central mesh (Wiehle, 1927; personal observation). This species may also add a broad, linear stabilimentum to the web. As Eberhard (1973) points out, spiral and linear stabilimenta probably serve to conceal the spider from predators. However, the flimsy stabilimenta constructed by *Zosis geniculatus* seem ill suited for this purpose.

When the spider senses a prey in its orb-web it usually jerks the web several times forcefully (as noted by Marples, 1962) in a manner reminiscent of members of *Hyptiotes* (Comstock, 1913; Gertsch, 1949) and *Miagrammopes* (Lubin *et al.*, 1978). This behavior is sometimes repeated as the spider approaches its prey and may serve to further entangle the prey, evaluate its size, or assure that it is securely held by the web and will not attack the spider. As the spider nears the prey, one of its first legs often probes and lightly contacts the prey by swinging in a small circle similar to the exploratory movements that Eberhard (1972) describes during spiral construction. Maintaining its distance, the spider turns away from the prey, hangs from its first and second legs and uses its fourth legs to throw silk onto the prey. This silk often does not encircle the prey but soon entangles its thrashing appendages. After a short time the spider moves closer and begins a thorough wrapping of the prey which may take from about one minute for a small fruit fly to 20 minutes for an insect as large as the spider. This wrapping, conducted while prey is held and manipulated with the second and third pairs of legs, begins with the struggling prey still in the web's mesh and continues as the prey is partly or completely cut or torn from the web (larger prey are often left suspended by a thread at either end of the body and rotated on this axis during wrapping). The spread first legs support the spider and the fourth legs manipulate silk used for wrapping. The prey is then carried to the web's hub where additional layers of silk may be added before the

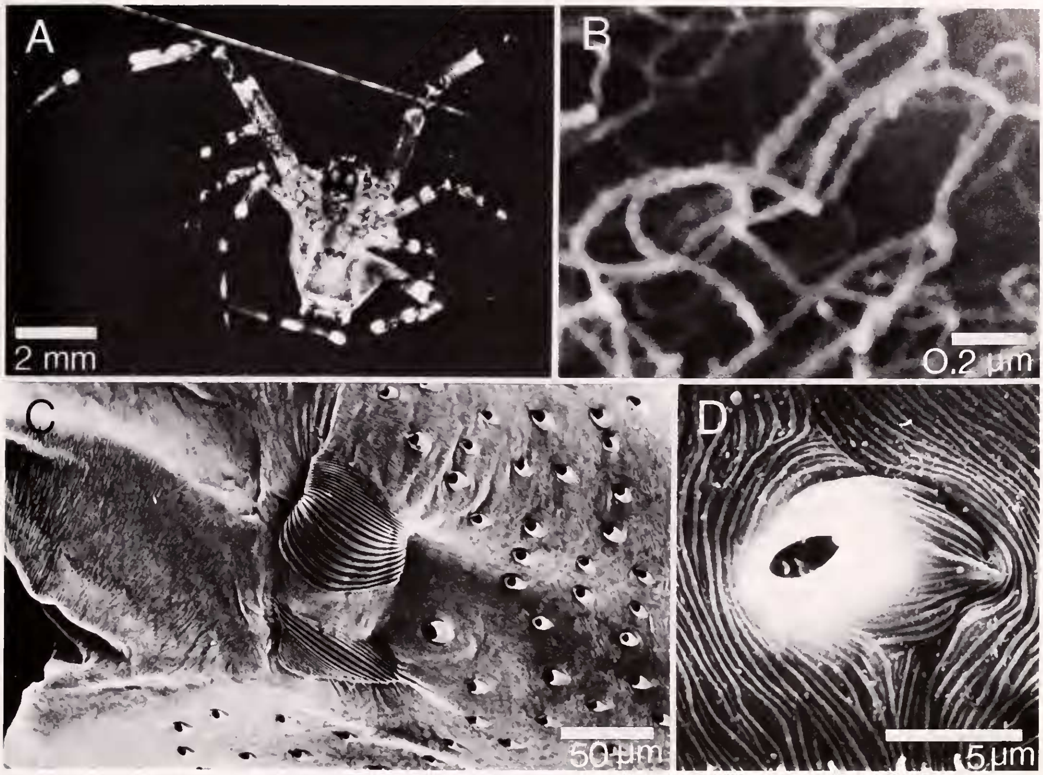


Plate 2. A. *Zosis geniculatus* female spinning cribellate silk. B. Cribellate silk strands of *Uloborus penicillatus* female. C. Retrolateral view of *Philoponella republicana* female first patella showing unsclerotized notch (left) bordering lyriform organs. D. First tarsal organ of *Zosis geniculatus* female.

spider grasps the prey with its palpal claws and begins to feed. Members of this family, lacking poison glands, both kill and digest prey by pouring digestive enzymes onto it. The prey's thick silk wrapping becomes transparent as it absorbs these enzymes and the extreme thickness of this covering may be useful for its absorptive properties rather than strictly for prey restraint. Uloborids do not use their chelicerae to pierce or knead prey and require as much as three hours to feed on a 5 to 6-mm-long beetle. Feeding, though slow, is thorough and when complete, only the prey's exoskeleton remains.

Convex eggsacs of *Polenecia* and *Hyptiotes* are form-fitted to and nearly indistinguishable from the surfaces of twigs on which they are constructed (Comstock, 1913; Scheffer, 1905; Wiehle, 1931). Members of the genera *Uloborus, Zosis, Philoponella,* and *Miagrammopes* construct suspended, stellate to cylindrical eggsacs. *Philoponella tingena* and *Zosis geniculatus* first construct a horizontal silk platform in their webs, deposit a cluster of 40 to 80 eggs under this platform, and then spin a form-fitting, convex covering around this egg mass, attaching its margins to those of the upper platform. Such eggsacs usually have five to eight marginal points which represent attachment sites of lines supporting the platform. These observations agree with those of *Uloborus diversus* made by Eberhard (1969). *Zosis geniculatus* leaves its thin-walled, pink to light purple eggsac in the orb's mesh where it is seemingly ignored. *Philoponella tingena* females, on the other hand, remove their thick-walled, dark gray eggsacs, resuspend them in a vertical orientation from the orb's perimeter or framework threads, and usually hang immediately above or beside them (Simon, 1891; pl. 4). It is not clear if *P. tingena* females remain with their eggsacs during the approximately twenty days required for spiderlings to emerge, but I observed several females with eggsacs daily for as long as eight days and each time the spider was hanging above her eggsac. *Uloborus diversus* females hang their eggsacs at the web's perimeter (Eberhard, 1969), but *U. glomosus* females arrange their eggsacs in the web's mesh (Emerton, 1883). Lubin *et al.* (1978) describe the structure and placement of *Miagrammopes* eggsacs.

Spiderlings molt once within the eggsac and emerge as second instars. Newly emerged *Philoponella tingena* spiderlings remained clustered near their eggsac about a day before ballooning away. These spiderlings and a few apparently third instar spiderlings constructed horizontal sheet webs similar to those described for *Uloborus diversis* (Eberhard, 1969), *U. walckenaerius* and *Zosis geniculatus* (Wiehle, 1927), *Philoponella vicina* (Peters, 1953), *U. plumipes* (Szlep, 1961), and *U. penicillatus* (personal observation). Initial stages in construction of these sheet webs are similar to early stages of orb-web construction seen in subsequent immature instars and mature females. However, second and a few third instar spiderlings lack a functioning cribellum and calamistrum and, unable to produce a usable capture spiral, begin laying down numerous fine secondary radii after the temporary spiral has been completed. Spiderlings attach these nonsticky radii only at the web's hub and perimeter. This allows these fine strands to be blown by air currents before they come in contact with and attach to primary radii, temporary spiral, and other secondary radii. This explains the sheet appearance of these essentially carefully constructed webs. Mature males of *Philoponella, Uloborus,* and *Zosis* also lack a cribellum and calamistrum and construct a sheet web similar to that made by second instar spiderlings.

Since Simon's (1891) description of *Philoponella republicana* colonies, little has been published on this interesting presocial behavior which is apparently common among members of the genus *Philoponella.* Gertsch (1949) briefly describes this phenomenon, Peters (1953) describes aggregations of *P. vicina,* and Struhsaker (1969) notes that *P. tingena* are found in colonies of various sizes and are sometimes associated with webs of *Nephila clavipes.* Observations on *P. tingena* show colonies of this species similar to those described by Simon.

Philoponella tingena colonies contain as many as 50 individuals of all ages and in larger colonies mature males and females are found in about equal numbers. A careful search yielded a few solitary individuals and numerous small colonies of two of three (usually immature) individuals. Colonies were commonly associated with the long, irregular threads of *Achaearanea* webs; however, I found several individuals and a few small colonies in irregular scytodid webs and the barrier strands of *Nephila clavipes* webs. *Achaearanea* webs, often constructed in the protective hollows of buttress tree roots, appear to provide a ready-made set of framework threads among which *P. tingena* can begin building their webs. By removing *Achaearanea* females to tree trunks lacking spider webs I was able to study colonization of their newly constructed webs. Not only did second instar *P. tingena* balloon to these webs and construct sheet webs, but larger juveniles as well as mature males and females arrived within six days. One colony of three males, two females, and two juveniles was established ten days after the *Achaearanea* female began constructing her web.

Sheet webs of second instar spiderlings and orb-webs of immatures and mature females found with the colony's irregular framework threads are more or less horizontal. Mature males do not construct webs, but hang from framework threads, occasionally taking prey from the colony's sheet or orb-webs. Other than several apparently unsuccessful mating attempts, I observed no close interaction between individuals. Most juveniles and females hung from the hub of their respective webs and did not cluster in the center of the colony's framework threads as Gertsch describes. Females with eggsacs hung from framework threads, often those nearest the tree trunk.

INTRAFAMILIAL PHYLOGENY

Formulation of a clear hypothesis of uloborid intrafamilial relationship has been hindered by the: 1. traditional division of the family into subfamilies Uloborinae, Hyptiotinae, and Miagrammopinae and by emphasizing conspicuous carapace and web modifications of the latter two subfamilies while deemphasizing less striking, but potentially more significant forms of diversity within the Uloborinae, and 2. failure to carefully and fully study the family's diversity and employ a clearly defined method for translating this diversity into a phylogeny. This is not to say that uloborids have been neglected or that those studying them have been undiscerning. Rather, most studies treat the fauna of a limited geographical region and are concerned with the immediate task of describing and differentiating species.

By 1966 eight uloborid genera had been described, although, only five of these were widely recognized. In the first comprehensive treatment of the family since Simon (1892), Lehtinen (1967) described an additional eight genera and a new subfamily, Tangaroinae. Most of Lehtinen's genera are both valid and monophyletic, but his use of a chart for their description indicates only their distinctive features and subfamilial affiliation. Based on a study of web structure, Kaston (1964, 1966) suggests that uloborids evolved along two distinct and possibly polyphyletic lines: one leading via *Sybota* (nomenclatural changes make the cited genus *Polenecia*) to *Uloborus* and the other leading via *Hyptiotes* to *Miagrammopes*. However, the prevailing view of uloborids still seems best expressed by F. Pickard-Cambridge's 1902 statement that: "the spiders comprehended in this family probably have no near relations amongst existing forms; so that it is difficult to place them into any system of classification."

Whether one views this statement as a warning or a challenge depends largely on his evaluation and analysis of the family's diversity. Three such lines of diversity—male and female genitalia and the tracheal system—warrant separate consideration before being used as phylogenetic evidence.

Male Palpus. Despite extensive use of the uloborid male palpus to distinguish species, no attempt has been made to precisely define terms given to its various parts or to assure that these terms are used only for homologous structures. This problem seems to center around use of the term "conductor" for any sclerite serving to support and orient the embolus. By their comparison of the shape and size of the "conductors" of different genera and their failure to specify otherwise, Muma and Gertsch (1964), Lehtinen (1967), and others imply that these structures are homologous, when in fact, any one of five different sclerites may serve to support and orient the uloborid embolus. To avoid confusion, I will use the functional term *guide* for these five analogous structures and restrict the term *conductor* to its apparently original use for the specific uloborid sclerite defined below.

In selecting terms to describe the male palpus, I have retained and carefully defined terms historically associated with

TABLE 1. ABBREVIATIONS USED IN ILLUSTRATIONS.

MALE PALPUS:	
STRIDULATORY FILE	SF
STRIDULATORY PICK	SP
CYMBIAL MACROSETAE	CM
FEMORAL TUBERCLE	FT
BASAL HEMATODOCHA	BH
SUBTEGULUM	ST
MIDDLE HEMATODOCHA	MH
TEGULUM	T
TEGULAR SPUR	TS
MEDIAN APOPHYSIS	MA
MEDIAN APOPHYSIS BULB	MAB
MEDIAN APOPHYSIS SPUR	MAS
EMBOLUS	E
SPERM RESERVOIR	RES
FUNDUS	F
CONDUCTOR	C
CONDUCTOR BASAL LOBE	CBL
CONDUCTOR SPIKE	CS
RADIX	R
FEMALE GENITALIA:	
SPERMATHECA	S
FERTILIZATION DUCT	FD
ACCESSORY GLAND	AG
POSTERIOR PLATE	PP
FIGURE SCALE LINES:	
a	0.1 mm
b	0.2 mm
c	0.5 mm
d	1.0 mm

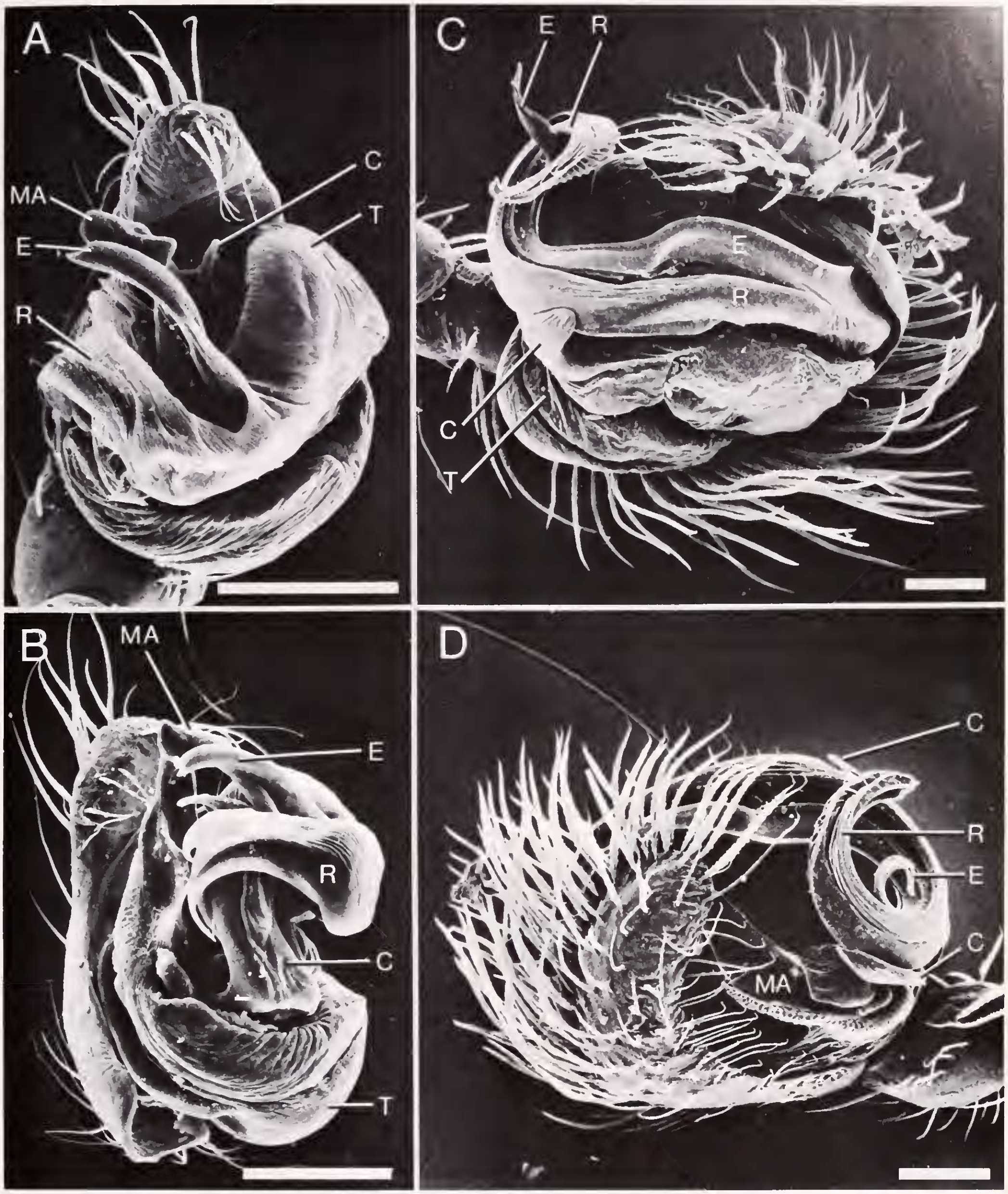


Plate 3. A. Retrolateral view of *Ariston mazolus* male left palpus. B. Prolateral view of *Ariston mazolus* male left palpus. C. Prolateral view of *Siratoba referena* male left palpus. D. Apical view of *Siratoba referena* male left palpus. All scale lines are 100 μm long.

the family and introduced additional terms only when it was necessary to distinguish previously unrecognized sclerites. Sclerites or projections arising from previously named structures are given names which reflect this attachment. Use of terminology common to other spider families does not imply that uloborid pal-

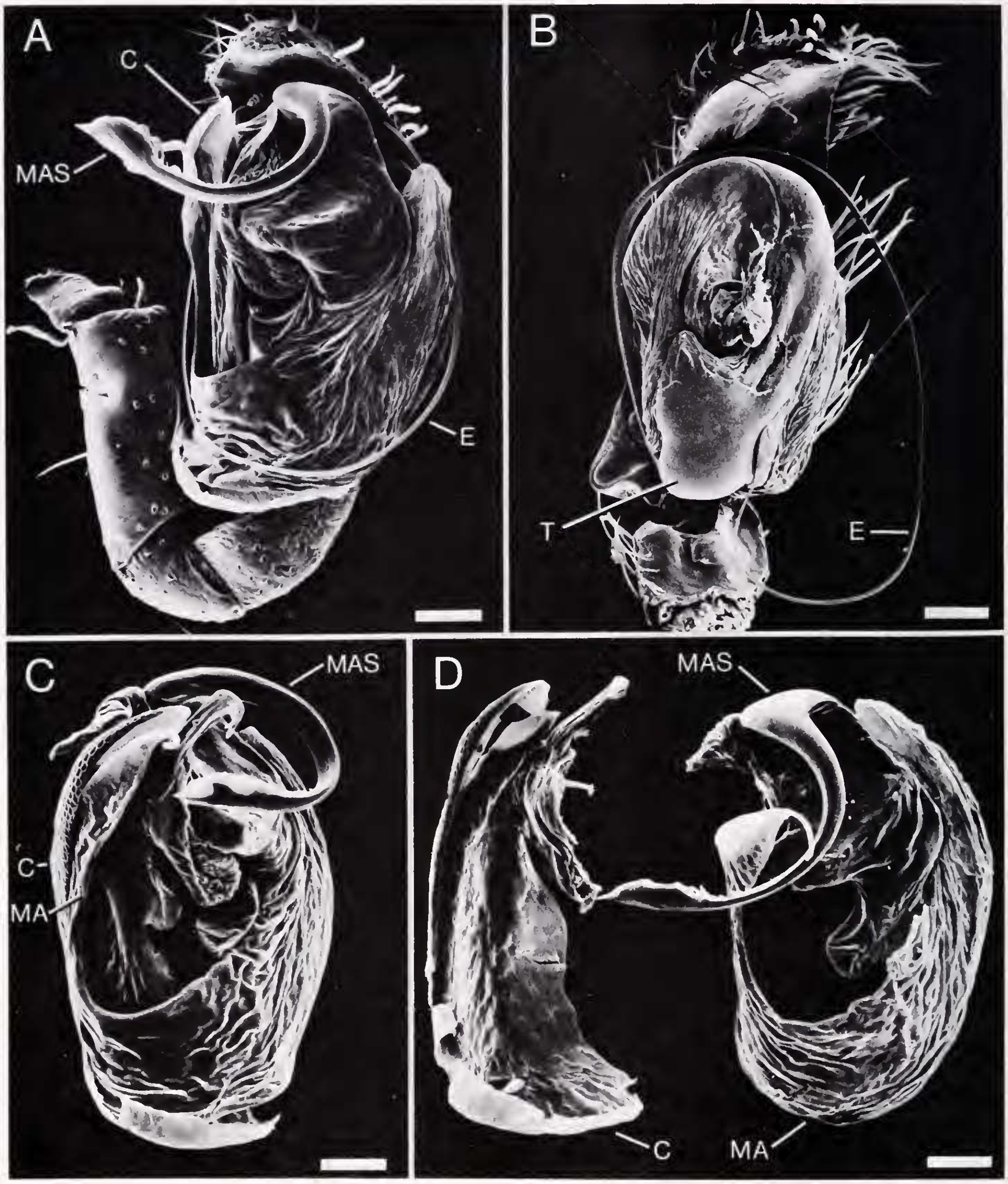


Plate 4. A. Retrolateral view of *Hyptiotes gertschi* male left palpus. B. Retrolateral view of *Hyptiotes gertschi* male left palpus with conductor and median apophysis removed. C. Retrolateral view of *Hyptiotes gertschi* male left palpus conductor and median apophysis removed from base of palpus. D. Conductor and median apophysis of *Hyptiotes gertschi* male left palpus removed and separated. All scale lines are 100 μm long.

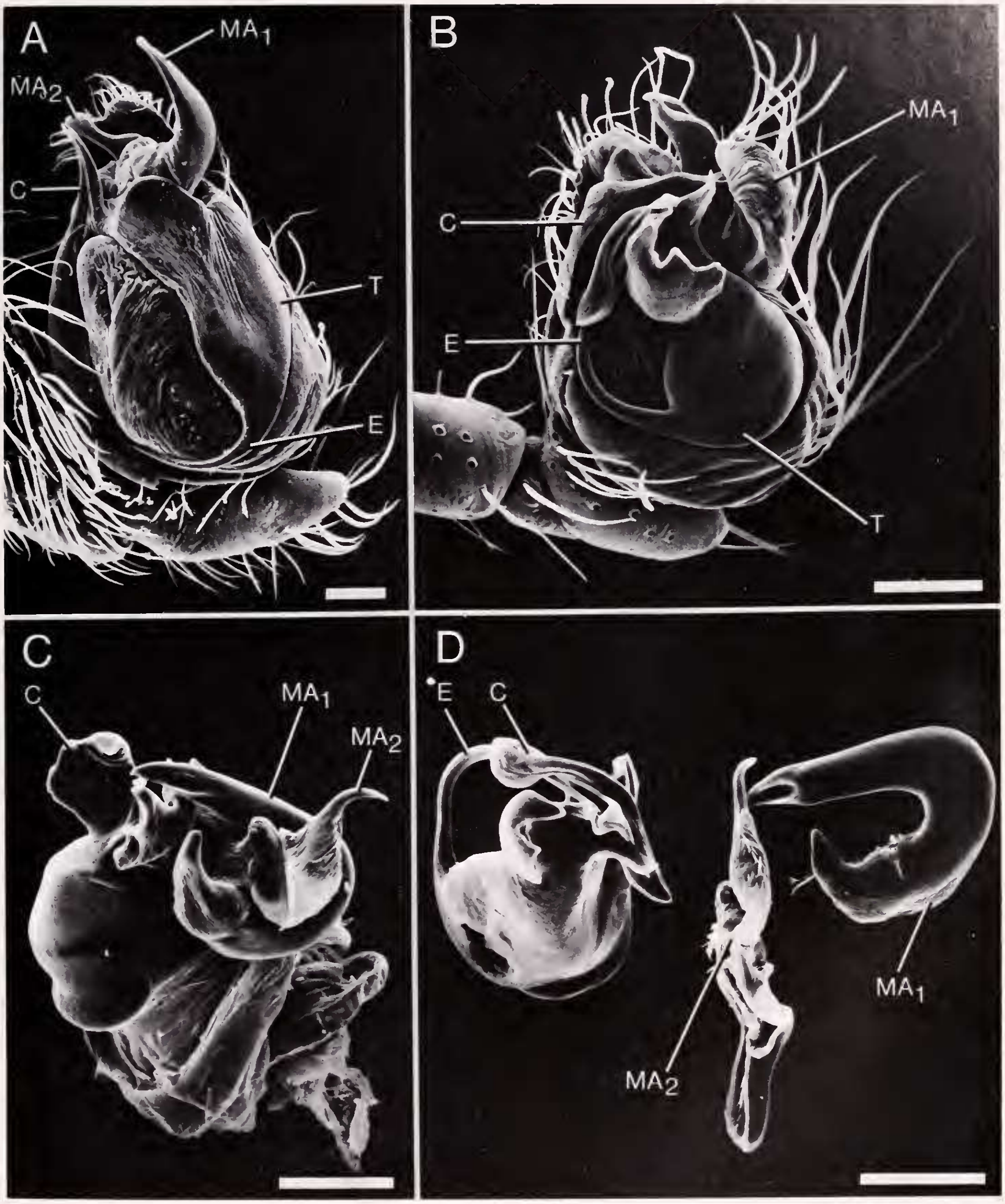


Plate 5. A. Retrolateral view of *Miagrammopes* sp. (from Tai Pin) male left palpus. B. Retrolateral view of *Miagrammopes simus* male left palpus. C. Apical view of *Miagrammopes simus* male left palpus with cymbium (attachment at lower right) removed. D. Apical region of *Miagrammopes simus* male left palpus separated to show components. All scale lines are 100 μm long.

pal structures are homologous to similarly named structures in these families. Rather, the primitive (simple) nature of the palpi of *Waitkera* indicates that most sclerites of uloborid palpi have evolved independently.

Endites of *Tangaroa*, *Waitkera*, and *Polenecia* have a small stridulatory file on their lateral surfaces (Figs. 19, 28, 46), described here for the first time. In *Tangaroa* two and in *Waitkera* three macrosetae, on the distal, ventral cymbial rim serve as picks (SP) (Figs. 19, 28). Two apparently homologous macrosetae (CM) (Plates 6-C, D; 7-C) found on the male palpi of most other uloborid genera serve no obvious function. The palpal femur of *Octonoba*, *Zosis*, *Philoponella*, and *Uloborus* has one or two proximal, ventral tubercles (FT) (Plate 7-A, C, D). The palpal patella and tibia of most genera each have a stout dorsal seta (Fig. 28). In *Sybota* and *Miagrammopes* a dorsal tibial extension protrudes over the tarsus (Plate 5-A, B; Fig. 90). The cymbium of *Tangaroa* folds over the distal part of the tarsus (Fig. 19), apparently serving as a guide for the embolus (E).

Hematodocha and Tegulum. The distal portion of the male palpus of all genera bears a basal hematodocha (BH) and subtegulum (ST) (Figs. 201, 215, 236). A middle hematodocha (MN) and tegulum (T) is present in *Octonoba*, *Purumitra*, *Zosis*, *Philoponella*, and *Uloborus* (Plate 7-A, D). In the remaining genera the region between the subtegulum and median apophysis (MA) is not pleated (Plates 3–6) and it is unclear whether this region represents a modified subtegulum, hematodocha, or tegulum. For this reason it is not named; although, its distal surface which gives rise to the median apophysis is termed the tegulum. In *Zosis*, *Octonoba*, and *Purumitra* a thin tegular spur (TS) arises from the lateral tegular surface and serves as an embolus guide (Plates 6-C; 7-C, D).

Embolus. In this study I recognize three divisions of the male sperm duct: 1. the free (projecting) embolus (E) containing an ejaculatory duct (ED), 2. a slender reservoir (RES), and 3. an enlarged fundus (F). Only in *Tangaroa* (Fig. 19) and possibly in *Siratoba* and *Ariston*, where the embolus is a flat sclerite, is it possible or necessary to distinguish this sclerite from the ejaculatory duct within. In the remaining genera the slender, sclerotized embolus closely conforms to the ejaculatory duct diameter. Examination of male palpi cleared in clove oil did not permit observation of taenidiae and, therefore, I define the reservoir and fundus by size and position rather than by wall structure as does Comstock (1910). The embolus arises from the dorsal or median tegular surface and, when the left tarsus is viewed apically, loops in a clockwise direction (Plates 3-D; 4-B; 5-A, B; 6-B–E, 7-C–D).

Radix. A radix (R) arises near the embolic base and appears to be a primitive feature of all uloborids except *Tangaroa*. In *Waitkera* the radix is a prominent scape (Figs. 28, 29) and in *Ariston* and *Siratoba* it functions as a guide (Plate 3, Figs. 68, 69). The radix of *Polenecia*, *Purumitra*, *Octonoba*, and Pacific *Philoponella* is a short flange and in the latter three genera is usually hidden by the median apophysis (Plate 6-D, E). Remaining genera lack a radix. Presence of the radix in some *Philoponella* and absence in others indicates that this sclerite's absence in this and all other genera but *Tangaroa* is the result of loss.

Median Apophysis. In all genera but *Tangaroa* a median apophysis arises from the tegulum's center and is usually partially or completely encircled by the embolus. The median apophysis of *Waitkera* consists of a small proximal lobe and a flat distal portion with a grooved ventral surface that forms a guide (Figs. 28, 29). In *Polenecia* (Figs. 46, 47) the median apophysis' distal portion is a flat plate and the proximal lobe is expanded, serving along with the conductor (C) as an embolus guide. Nearctic members of the

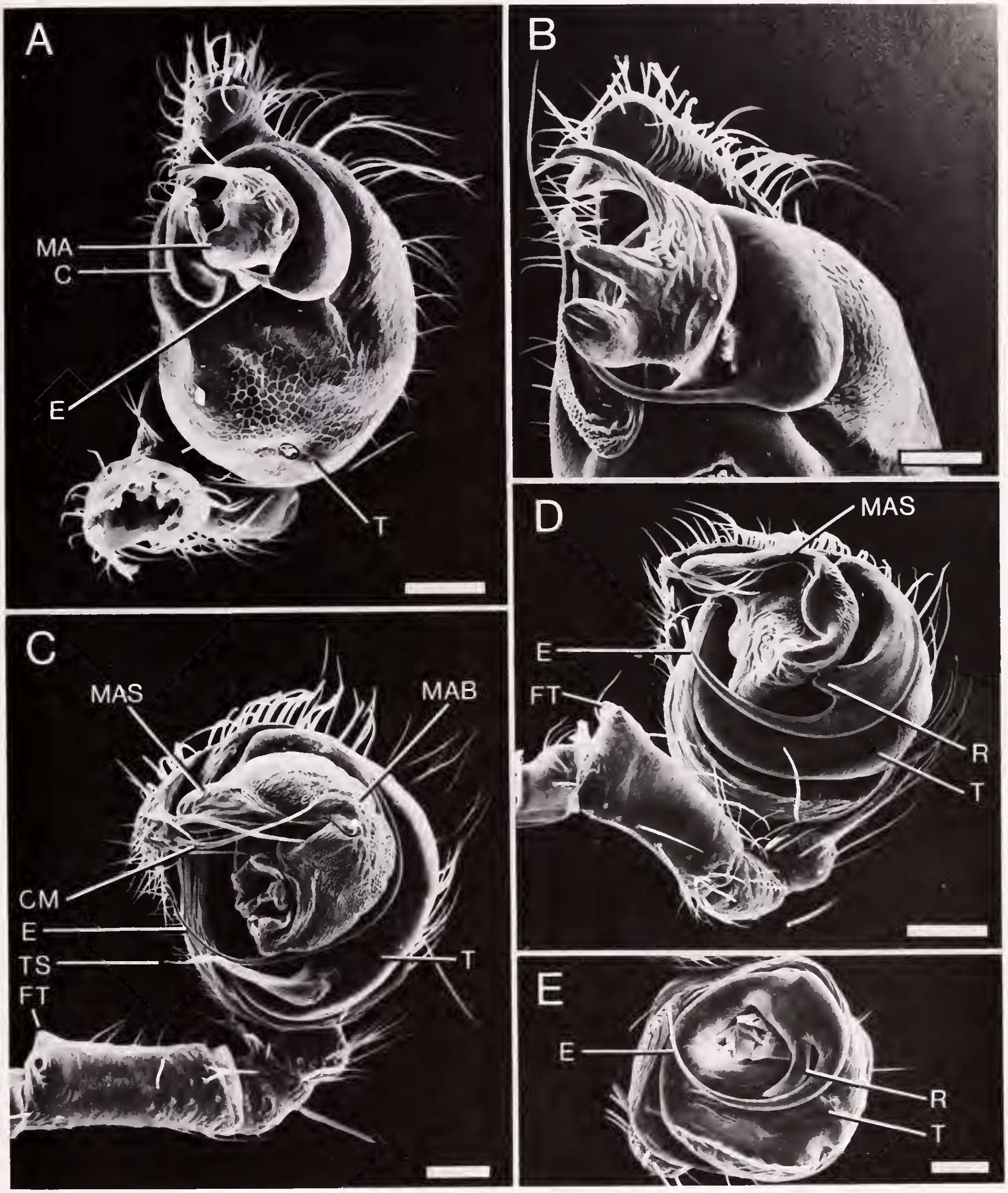


Plate 6. A. Retrolateral view of *Sybota abdominalis* male left palpus. B. Retrolateral view of apex of *Sybota osornis* male left palpus. C. Retrolateral view of *Octonoba* species 1 male left palpus. D. Retrolateral view of *Octonoba* species 2 male left palpus. E. Apical view of male left palpus of *Philoponella* sp. from Woodlark Island with bulb and conductor removed to expose embolus and radix. All scale lines are 100 μm long.

genus *Hyptiotes* have a long, curved, distally expanded median apophysis (Plate 4), whereas Palearctic and Oriental members have a short, flat median apophysis. In all members of this genus the proximal portion of the median apophysis is flat, curved, and tightly appressed to the grooved conductor to form a guide. This composite guide is termed the "conductor" by Muma and Gertsch (1964), Shear (1967), and Lehtinen (1967). Muma and Gertsch (1964) and Shear (1967) refer to the flattened tip of the proximal median apophysis lobe protruding from the conductor groove as the "radix." This term is unnecessary and inconsistent with the radix as defined above. Members of the genus *Siratoba* (Plate 3-C, D; Figs. 68, 69) have a proximal median apophysis lobe whose lateral surface forms a trough that accepts the conductor and radix-embolus unit. In this genus the distal lobe of the median apophysis is a flat sclerite with a concave terminus that appears to accept the tip of the proximal median apophysis lobe (Figs. 68, 69). The median apophysis of *Ariston* forms an elongate projection with an angular terminus (Plate 3-A, B). In *Sybota* the median apophysis is a broad sclerite with two or three distal projections (Plate 6-A, B). *Miagrammopes* is characterized by having an apical median apophysis with two lobes modified into projections of various shapes which are therefore difficult to designate as basal or apical. For this reason these lobes are designated MA_1 and MA_2 in Plate 5. Some members of the genus *Octonoba* have a concave median apophysis distal lobe which may serve as a guide (Plate 6-C, D). In other members the distal region of the median apophysis is rolled, forming a tube (Plate 7-D). Two regions can be distinguished in the median apophyses of members of the genera *Zosis*, *Ponella*, *Philoponella*, and *Uloborus*: a basal, hemispherical median apophysis bulb (MAB), probably homologous with the proximal median apophysis lobe described above, and a distal small, hooked median apophysis spur (MAS), probably homologous with the distal median apophysis lobe (Plate 7).

Conductor. The conductor (C) is a sclerite arising at the junction of the median apophysis and tegulum (Plates 3–7). In several genera the conductor's rugose surface aids in its identification (Plates 4-C, 6-B). No conductor is present in *Tangaroa*, *Purumitra*, *Octonoba*, or *Zosis*. However, in *Zosis*, *Purumitra* and *Octonoba* the small, unsclerotized lobe extending from the median apophysis bulb's center is probably homologous with the conductor (Plates 6-C; 7-C, D). The short, flat conductor of *Waitkera* (Figs. 28, 29) does not appear to function as an embolus guide. Conductors of *Polenecia*, *Hyptiotes*, *Siratoba* and possibly *Ariston* serve in conjunction with the median apophysis' basal lobe as a guide, while those of *Uloborus*, *Philoponella*, *Ponella*, *Miagrammopes*, and *Sybota* function independently as a guide. In many *Miagrammopes* the conductor, in addition to forming a trough in which the embolus lies, is also modified into a plate of various shapes (Plate 5-B–D). The conductor of *Polenecia* (Figs. 46, 47) consists of a broad basal plate with two distal projections, a small dorsal one and a longer, concave ventral one which, along with the basal portion of the median apophysis, serves as a guide. The same condition if found in *Hyptiotes* (Plate 4), but here the conductor is thinner and more extensive. In *Siratoba* (Plate 3-C, D; Figs. 68, 69) a Y-shaped conductor (C) lies proximal to the loop of the radix-embolus unit, apparently supporting it in its fork. The conductor of *Ariston* (Plate 3-A, B) extends distally under the radix and embolus, but its functional association with these sclerites is unclear. The conductor of *Miagrammopes*, *Sybota*, and *Uloborus* (Plates 5; 6-A, B; 7-A) is a trough-shaped basal lobe (CBL). In *Philoponella*, *Ponella*, and *Miagrammopes* a conductor spike (CS) is also present (Plates 5-A; 7-B).

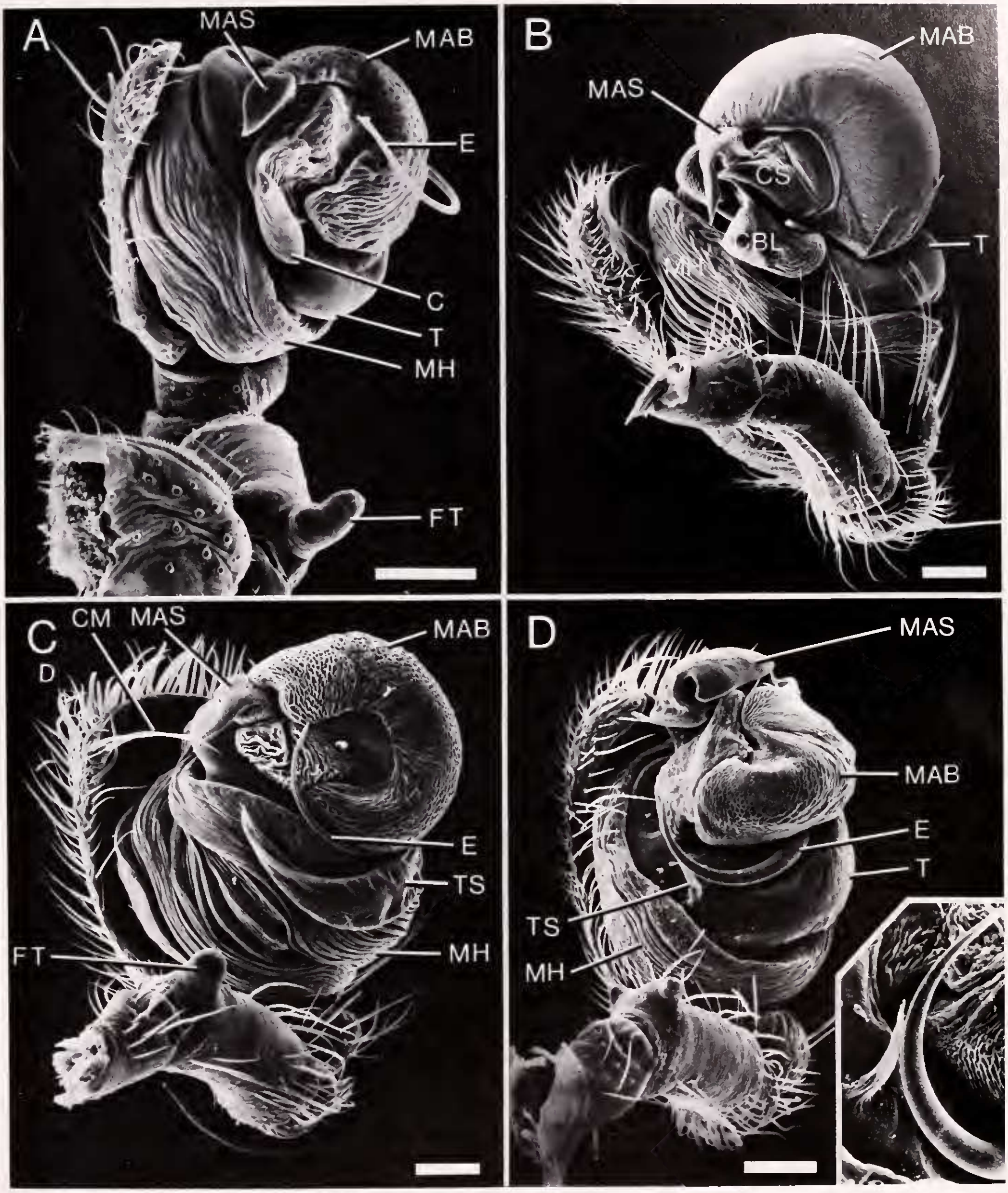


Plate 7. A. Retrolateral view of *Uloborus glomosus* male left palpus. B. Retrolateral view of *Philoponella republicana* male left palpus. C. Retrolateral view of *Zosis geniculatus* male left palpus. D. Retrolateral view of *Octonoba octonaria* left male palpus with insert showing tegular spur (small left projection) and embolus. All scale lines are 100 μm long.

Female Genitalia. The simplest female genitalia are found in *Tangaroa* and *Waitkera* where the epigastric furrow's anterior border is formed by a low, unsclerotized mound (Figs. 16, 30). In *Tangaroa* each of the two genital openings found on the epigastric furrow's anterior wall leads to a pair of blind spermathecae

(S) (Fig. 18). *Waitkera* females have a single median spermatheca which opens only into the vagina through a broad, hood-shaped dorsal passage (Fig. 31). Two small, blind, posterolateral accessory glands open at the posterior margin of the genital area. Chamberlain (1946) describes and illustrates an "epigynal" opening at each edge of the genital area's posteromedian indentation, apparently the openings of the glands described above.

Members of the genera *Polemecia*, *Ariston*, and *Hyptiotes* have a pair of blind accessory glands (AG) which appear to have an external opening distinct from the spermathecae and which may be either small (*A. albicans* and *A. mazolus*) (Figs. 34, 38) or large (*A. aristatus*, *Polenecia*, *Hyptiotes*) (Figs. 45, 54, 61, 62). In *Ariston* and *Polenecia* a pair of blind spermathecae arises from each genital opening (Figs. 34, 38, 45, 54). In *Hyptiotes* a long, coiled duct leads from each opening and may terminate in a fertilization duct (Figs. 61, 62). Muma and Gertsch (1964) misinterpret the accessory glands of *Hyptiotes* as spermathecae at the distal end of each long thin coiled duct. However, Wiehle (1927) correctly recognized the accessory glands and long sperm ducts as being unconnected. Females of *Ariston*, *Polenecia*, and *Siratoba* have a narrow to broad genital projection extending over a posteroventral concavity in which the openings are found (Figs. 32, 36, 43, 52, 65, 75). In *Hyptiotes* the genital area has a raised median ventral surface and a broad posterior plate whose narrow, median projection extends anteroventrally (Figs. 59, 60).

Members of the genera *Uloborus*, *Purumitra*, *Zosis*, *Octonoba*, *Daramuliana*, *Ponella*, and *Philoponella* have similar internal genitalia, characterized by a pair of external copulatory openings, each leading via a duct to a spherical spermatheca with a posterior fertilization duct (FD) (Figs. 139, 161, 180, 190, 200, 210). Epigyna of *Octonoba* and *Zosis* have two posterior lateral lobes whose posterodorsal margins form either a pair of atria (Figs. 184, 185) or a common atrium (Figs. 169, 171, 178, 179) in which copulatory openings are found. A sclerotized posterior plate (PP) lies dorsal to these atria (Figs. 171, 185). *Uloborus* has a similar epigynum, but lacks conspicuous atria, the epigynal copulatory openings being found at the posterior lobes' posterolateral margins (Figs. 138, 155). Epigynal openings of members of the genera *Daramuliana*, *Ponella*, and *Philoponella* lie anterior to the separated or medially united posterior lobes. In *Ponella* the posterior lobes are small mounds (Figs. 198, 199); whereas, in *Philoponella* and *Daramuliana* they appear to form the posterior rim of an oval or medially divided atrium, respectively, in which copulatory openings are found (Figs. 189, 208). Members of *Purumitra* have two pairs of sagittally divided median atria and two pairs of lateral atria (Fig. 160).

Female *Sybota*, *Siratoba*, *Orinomana*, and *Miagrammopes* have a duct (in *M. simus*, Fig. 96, a large bulb and a duct) leading from each epigynal opening to a large, blind spermatheca (Figs. 89, 94, 95, 96, 109, 119, 125, 128). At the base of each spermatheca (or of a thinner duct leading to it) arises either a fertilization duct or an expanded region giving rise to a fertilization duct. Members of *Sybota* are charaterized by having an epigynum with a prominent, well-sclerotized posterior plate, the tip of which is visible in ventral view as a median extension between lighter lateral areas at whose anterolateral margins the epigynal openings are situated (Figs. 105–108, 112, 113). The epigynum of *Orinomana* has a posterior indentation with openings situated at its lateral margins (Figs. 123, 124, 126, 127). *Siratoba* has a prominent epigynal hood which forms a posterior atrium housing openings at the ventrolateral margins of the posterior plate (Figs. 65, 66, 75, 76). Within the genus

Miagrammopes s.l. a variety of epigynal patterns is found, ranging from a simple posterior margin with lateral openings (Fig. 88) to a deeply notched posterior margin with posterolateral extensions, a posteromedian scape, and an anteromedian rim.

Discovery that members of the genus *Tangaroa*, *Waitkera*, *Polenecia*, *Ariston* and possibly *Siratoba* and *Hyptiotes* are haplogyne (*sensus* Wiehle, 1967; Cooke, 1969) shows Uloboridae to be an older lineage than previously thought. Members of *Tangaroa*, *Polenecia*, and *Ariston* lack fertilization ducts and have two pairs of spermathecae, each spermatheca connected by a duct to the genital opening on the epigastric furrow's anterior wall. Platnick and Gertsch (1976) and Platnick (1977) consider two pairs of spermathecae a primitive feature of spiders, but Platnick (1977) regards such structures in all non-hypochiloid araneomorphs as a modified single pair of spermathecae. Such modification no doubt explains the multiple spermathecae of many spiders. However, the striking similarity between female genitalia of *Hypochilis* (Gertsch, 1958; figs. 14, 16, 20, 21), *Hexathele* (Forster and Wilton, 1968; figs. 487–497, 510–514) and those of *Tangaroa*, *Polenecia* and *Ariston* (Figs. 18, 34, 38, 45, 54) suggests that genitalia of these three uloborid genera represent primitive haplogyne patterns and are not derived secondarily.

The single median spermatheca of *Waitkera* (Fig. 31) distinguishes it from other uloborids. However, the male palpal structure of *Waitkera* (Figs. 28, 29) suggests that this genus is allied with *Tangaroa* and *Polenecia* and the presence of a pair of small, presumptive lateral spermathecae indicates that a median pair of spermathecae may have fused to form the central spermatheca.

Female genitalia of *Orinomana*, *Sybota*, and most *Miagrammopes* are similar in having an anterior pair of blind spermathecae and a posterior pair of spermathecae (reduced in *Sybota abdominalis*) which give rise to fertilization ducts, making these genera entelegyne. I hypothesize that these spermathecae are homologous with those of *Tangaroa*, *Polenecia*, and *Ariston* and that, with the possible exceptions of *Hyptiotes* and *Siratoba*, fertilization ducts arose only once in entelegyne uloborids. Implicit in this hypothesis is homology between the posterior pair of *Orinomana*, *Sybota*, and *Miagrammopes* spermathecae and the single pair of spermathecae in the remaining entelegyne uloborids.

To my knowledge, no one has attempted to determine either histologically or developmentally whether fertilization ducts represent haplogyne ducts connecting the vagina and spermathecae or if they are newly evolved structures. The fertilization duct may have evolved in response to movement of the haplogyne genital openings from the deep recesses of the vagina to the posterior wall of the epigastric furrow and then to the ventral surface of the genital region. Only when these openings moved out of the epigastric furrow and were no longer able to supply sperm to eggs still within the protective recesses of the epigastric furrow, would there be selective pressure for evolution of a new set of tubes through which sperm could reach the eggs. This hypothesis considers female copulatory openings (into which the male inserts his embolus) of all spiders homologous and fertilization ducts apomorphic structures, derived one or several times.

If, on the other hand, one considers the fertilization ducts homologous with ducts connecting the spermathecae and vagina of haplogyne spiders, one is faced with the difficulty of explaining how male mating behavior and palpal structure responded to a sudden need to use a new and differently placed aperture for insemination. It is difficult to envision a spider so versatile or a population so diverse as to permit this. A similar problem arises if the fertilization duct is considered homologous with one of the paired lateral spermatheeal ducts of haplogyne spiders and the other duct homologous with the bursa leading from an external opening. Only after the two spermathecae were connected by a newly evolved duct could the external opening be used by the male. This hypothesis is subject to the previous criticism and also questions what selective pressures could be called upon to explain evolution or movement of a nonfunctioning aperture.

These conclusions, if correct, support Shear's (1978) contention that "the haplogyne condition represents a grade and not a clade" by showing that the haplogyne-to-entelegyne transformation has occurred within a monophyletic lineage. Belief that Cribellata and Ecribellata represent separate and monophyletic lineages has been undermined by studies of Lehtinen (1967), Forster (1968), Baum (1972), and others and toppled by Platnick's (1977) analysis of this issue. This being the case, discovery of a single family with both haplogyne and entelegyne members supports Brignoli's (1975) conclusions by seriously challenging the validity of grouping either cribellate or ecribellate families solely on the degree of genitalic development.

Tracheal System. Bertkau (1878) reported and Lamy (1902) confirmed that *Uloborus walckenaerius* Latreille had a stout pair of tracheal trunks which extended from a common atrium into the cephalothorax where they divided into tracheoles which entered the legs. Lamy (1902) and Petrunkevitch (1933) found a similar pattern in *Miagrammopes*, but Petrunkevitch reported that in *Uloborus geniculatus* the two trunks split into tracheoles upon reaching the petiole. A study of the Uloboridae shows four basic tracheal patterns: 1. tracheoles restricted to abdomen (Fig. 1), 2. tracheoles extending into cephalothorax (Fig. 2), 3. four stout tracheal trunks extending into cephalothorax (Figs. 3, 5), and 4. two stout tracheal trunks extending into cephalothorax (Figs. 7, 9, 11). Within the cephalothorax only two patterns can be distinguished: one in which several small tracheoles serve each leg (Figs. 4, 6, 8, 10) and a second, found only in *Miagrammopes*, in which only one large trachea serves each leg (Fig. 12).

Tracheae always arise from a broad, common atrium near the cribellum. More extensive tracheal patterns are not associated with forward movement of the spiracle as in Hahniidae (Forster, 1970; Petrunkevitch, 1933), some Tetragnathidae (Levi, 1967), and Anyphaenidae (Platnick, 1974). From the atrium's lateral margin small tracheae, shown by Purcell (1909, 1910) to be homologous with book lungs, extend posteriorly, presumably to serve silkglands and spinnerets. From the atrium's anterior margin two stout median tracheal trunks extend into the abdomen (pattern 1) or the abdomen and cephalothorax (patterns 2–4). In the latter case each median trachea gives rise to a large lateral branch which divides into tracheoles that supply the abdomen. In pattern 3 these lateral branches arise just posterior to the median trunks' bifurcation.

The generally accepted view that in spiders an extensive tracheal system evolved primarily to reduce respiratory water loss is presented by Levi (1967) and is well documented for small spiders. Anderson (1970) accepts this explanation, but suggests and provides supporting evidence for the hypothesis that tracheal systems also evolved to supply increasing oxygen demands associated with increasing metabolic rates. Higher metabolic rates, he suggests, resulted when more reliable food supplies initiated more active forms of prey capture, increased fertility and more rapid development rates. Citing his findings and those of Davis and Edney (1952) and Dresco-Derouet (1960), who discovered that blockage of the tracheal spiracle caused no significant decrease in basal

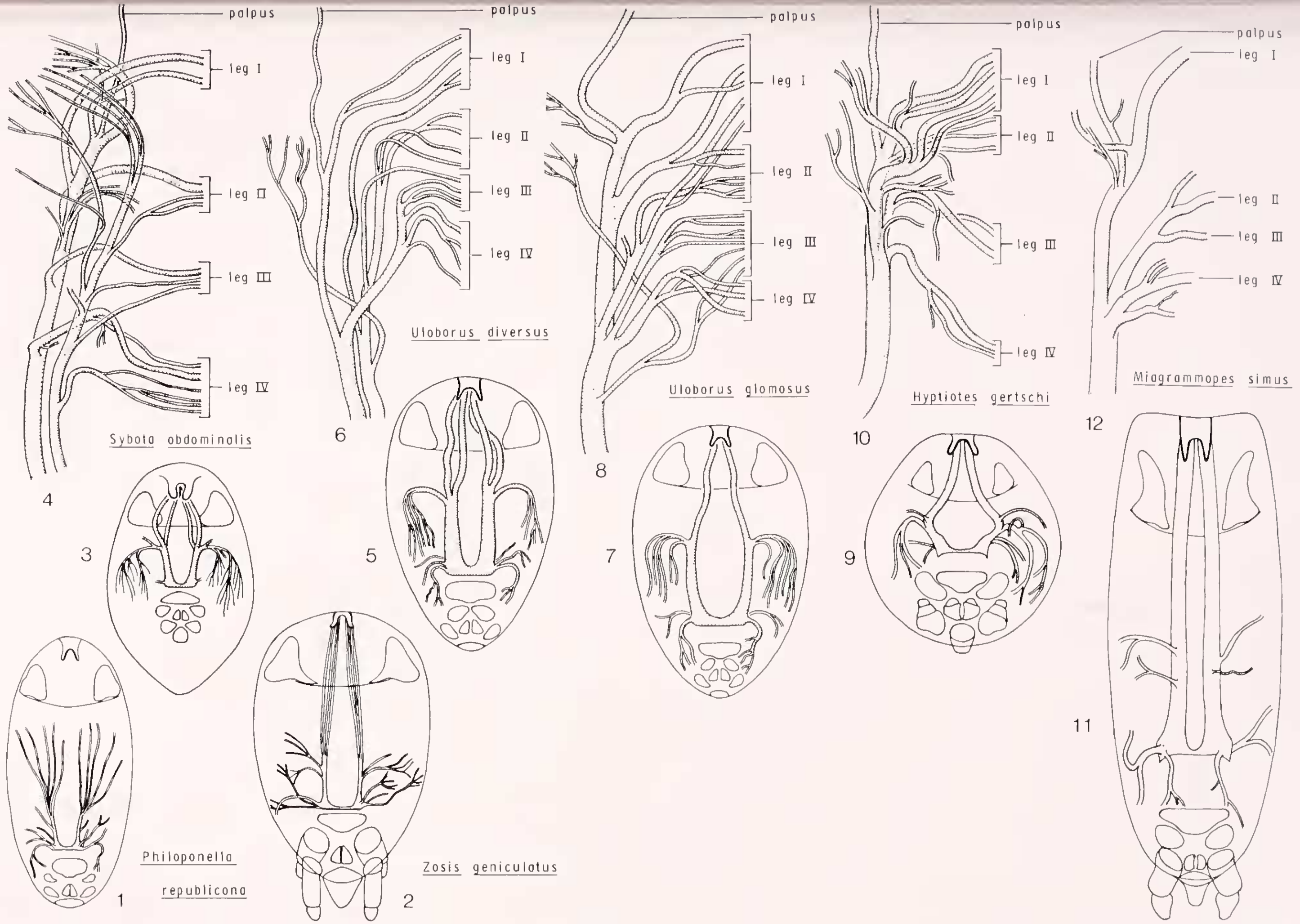


Figure 1. *Philoponella republicana* (Simon) abdominal tracheal pattern. Figure 2. *Zosis geniculatus* (Olivier) abdominal tracheal pattern. Figures 3–4. *Sybota abdominalis* (Nicolet). 3. Abdominal tracheal pattern. 4. Cephalothoracic tracheal pattern. Figures 5–6. *Uloborus diversus* Marx. 5. Abdominal tracheal pattern. 6. Cephalothoracic tracheal pattern. Figures 7–8. *Uloborus glomosus* (Walckenaer). 7. Abdominal tracheal pattern. 8. Cephalothoracic tracheal pattern. Figures 9–10. *Hyptiotes gertschi* Chamberlin and Ivie. 9. Abdominal tracheal pattern. 10. Cephalothoracic tracheal pattern. Figures 11–12. *Miagrammopes simus* Chamberlin and Ivie. 11. Abdominal tracheal pattern. 12. Cephalothoracic tracheal pattern.

(resting) metabolic rate, Anderson further hypothesized that it is largely during periods of activity that tracheae serve to prevent respiratory water loss and to provide large amounts of oxygen. Levi and Kirber (1976) cite studies supporting the hypothesis that tracheae are particularly important in supplying oxygen to the cephalothorax during periods of activity when, in order to generate hydrostatic pressure for leg extension, hemolymph circulation between cephalothorax and abdomen is thought to be stopped. A comprehensive reivew of studies relating to hydrostatic pressure and locomotion is presented by Anderson and Prestwich (1975) who also present evidence showing that during extreme activity retrograde flow and resulting accumulation of hemolymph in the abdomen is attenuated by: 1. closure of a valve between the heart and anterior aorta, 2. increased abdominal hemolymph pressure, 3. rigidity of the book lungs, and 4. large pressure drops as venous hemolymph passes through the book lungs. These findings indicate that circulation of oxygen-carrying hemolymph between abdomen and cephalothorax may not be completely blocked during activity or, if so, is stopped for only short intervals. Owing to proportional hemolymph distribution and maintained abdominal hemolymph pressure, flow is quickly restored when activity ceases. Anderson and Prestwich hypothesize that reliance on cephalothorax-generated fluid pressure for leg extension allowed more leg muscle mass to be devoted to flexion, thereby increasing strength for prey capture. Carrying this reasoning a step further, I suggest that some advanced tracheal systems may have evolved largely to supply the increased oxygen demands of these flexor muscles.

To summarize, an advanced tracheal system which extends into the cephalothorax may serve to: 1. reduce respiratory water loss, 2. increase total oxygen supply, 3. supplement or replace hemolymph-carried oxygen during periods of activity, and 4. supply oxygen specifically to leg flexor muscles. Although these four functions are not mutually exclusive, it is likely that tracheal patterns found in different families or even those found within a single family evolved under selective pressures favoring a certain function or set of functions.

Habitats, behavior and webs of many uloborid genera are unknown, but evidence suggests that tracheal patterns 3 and 4 of some genera serve largely to supply oxygen for extended or particularly strenuous leg flexure. Members of the genera *Polenecia*, *Hyptiotes*, *Miagrammopes*, construct reduced, highly specialized webs (see Natural History) and have tracheal pattern 4. *Hyptiotes* and *Miagrammopes* (perhaps *Polenecia* as well) support and flex the web while waiting for prey and vigorously jerk the web to ensure prey entrapment. Tracheal patterns of *Sybota* and *Orinomana*, shown by this study to be closely related to *Miagrammopes*, may facilitate similar specializations of web and behavior.

Among genera known to construct orb-webs (*Waitkera*, *Zosis*, *Octonoba*, *Philoponella*, and *Uloborus*) all four tracheal patterns are represented. Size ranges of these genera are similar with smaller species belonging to *Philoponella* (tracheal pattern 1). In Panama and Colombia I collected specimens of *Philoponella*, *Uloborus* (tracheal patterns 3 and 4), and, less often, *Miagrammopes*, in the same habitat. However, in captivity members of the latter genus appeared least resistant to desiccation and members of *Uloborus* less resistant than *Philoponella*. A large *Zosis geniculatus* (tracheal pattern 2) population discovered in Panama Canal Company warehouse B by Yael Lubin thrives in the apparent absence of free water.

Tracheal patterns are usually considered to evolve from simple to more extensive patterns. However, the following analysis of uloborid intrafamilial phylogeny indicates that the more extensive tracheal pattern 4 is either primitive in the family or has evolved independently at least five times. I favor the former explanation because of its greater parsimony. The literature, however, provides no insight into selective pressures responsible for reduction of the tracheal system and seems to dismiss this possibility.

Apparent desiccation resistance of *Philoponella* and *Zosis* indicates that tracheal patterns 1 and 2 are not detrimental in this regard. Web-hanging postures and relatively smaller femur diameters suggest that members of these genera expend less energy during web monitoring and prey entrapment and therefore may require less oxygen. In this case a well-developed tracheal system might prove disadvantageous because it would require an added initial investment of tissue and perhaps slightly raise basal metabolic rate and respiratory water loss.

Discussion. Members of the family Uloboridae possess six potentially synapomorphic (shared, uniquely derived) characters: 1. loss of poison glands, 2. presence of a ventral row of macrosetae on the fourth metatarsae and tarsae (Plate 1-A, C), 3. two apical cymbial setae on the male palpus, 4. production of an orb-web or web derived from an orb, 5. presence of a row of trichobothria on the second through fourth femora, and 6. stout tracheal trunks which extend into the cephalothorax. Absence of a plesiomorphic character is generally not admissible as phylogenetic evidence. However, the fact that all uloborid genera are united by the five other characters listed above and are the only araneomorph spider genera to lack poison glands seems good reason to consider this loss a character uniting all uloborids. This character, however, offers little insight into interfamilial relationship. Ventral macrosetae occur on the metatarsi and tarsi of other spiders, but those of uloborids are larger, more perpendicular, and more precisely in register than those present in other spiders I have examined. These macrosetae appear to handle silk used to wrap prey (see Natural History) and, as uloborids rely heavily on this ability, the extreme development of this setal row may be considered a family character. The structure of these macrosetae distinguishes them from setae of the theridiid comb row, also situated on the fourth tarsus. Two prominent setae on the apex of the male's palpal tarsus (Plate 3-A, 6-C, D) appear homologous with and derived from stridulatory picks of *Tangaroa*, *Waitkera*, and *Polenecia* palpi (Figs. 19, 28, 46). Until similar stridulatory apparati or setae are discovered in other spider groups, these setae must be considered unique to the family Uloboridae.

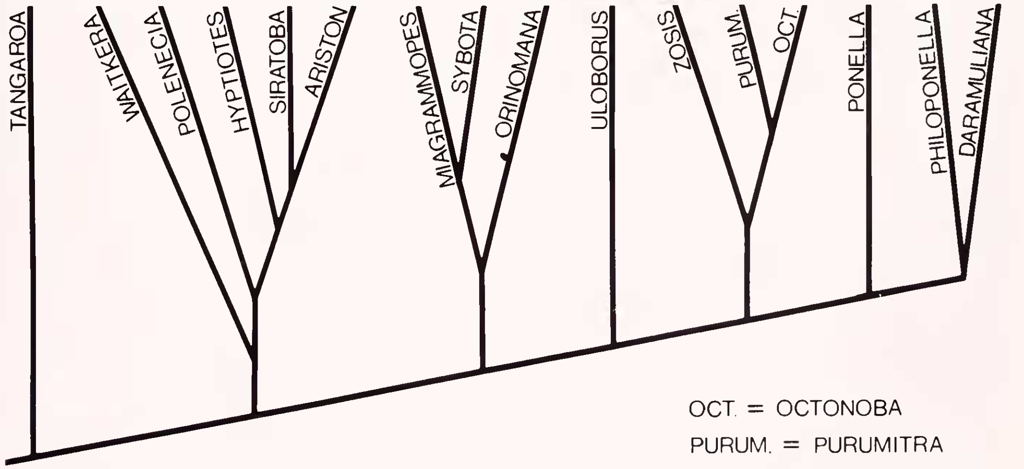
I interpret behavior responsible for orb-web production as an apomorphic (primitive) character of the family Uloboridae and the behavior of *Polenecia*, *Hyptiotes*, and *Miagrammopes* as a modification of this behavior. Several ingenious schemes have been proposed to explain the monophyletic or (more often) polyphylyetic origin of the orb-web from various simple web types (e.g., Kaston, 1964, 1966; Kullmann, 1972), but these remain largely untested by morphological or behavioral evidence. This study is not intended to be a comprehensive treatment of interfamilial relationship, rather it attempts to present a clearly defined hypothesis of uloborid intrafamilial relationship which will facilitate these broader studies. Presence of femoral trichobothria on the legs of all uloborids (Fig. 206) as well as the legs of some araneids provides support for the relation of these groups and monophyletic evolution of the orb-web. Uloboridae have a single row of prolateral femoral trichobothria on the third and fourth legs and a single retrolateral row on the second legs. The first femur has either a single or double row of dorsal trichobothria. It is generally recognized that members of the genus *Leucauge* have two rows of

Table 2: Characters Used in Table 3

Character	Primitive State ☐	Derived State a ■ b ▨
1 Calamistrum length/metatarsus IV	Less than half	a. half b. more than half
2 Embolus in cross section	Flat	a. round b. crescent
3 Radix	Absent	a. present b. bifurcate
4 Length of male palpal femur	4 x diameter	3 x diameter
5 Conductor	Absent	Present
6 Female genital projection	Absent	a. median b. lateral
7 Median apophysis	Present	Absent
8 Male first femur	Straight	With distal crook
9 Anterior lateral eyes	Present	Absent
10 Median spermatheca	Absent	Present
11 Macrosetae on cymbial margin	Two	Three
12 Accessory glands	Absent	Present
13 Dorsal trichobothria on ♀ femur I	1 row	2 rows
14 Female genitalia	Haplogyne	Entelegyne
15 Embolus guide	Does not include radix	Includes radix
16 Stridulatory apparatus	Present	Absent
17 Posterior abdomenal extension	Absent	Present
18 Apical cymbial spine	Absent	Present
19 Anterior half of carapace	Rounded	Narrowed
20 Posterior lateral eye tubercules	Absent	Present
21 Large middle hematodocha	Absent	Present
22 Median apophysis	Does not form a bulb	Forms a large bulb
23 Male palpal tibia	Small	With extension
24 Anterior median eyes	Present	Absent
25 Endite length	One-and-one-third width	Twice width
26 Cephalothoracic tracheal trunks	Two	a. four b. absent
27 Setal tuft on female tibia I	Absent	Present
28 Tegular spur	Absent	a. large b. small
29 Median apophysis spur	Absent	a. claw-like b. concave
30 Female genital openings	Posterior	Ventral
31 Tracheoles	Pass into cephalothorax	Restricted to abdomen
32 Epigynal atrium	Absent	a. undivided b. divided

TABLE 3. CLADOGRAM OF ULOBORIDAE GENERA USING CHARACTERS DESCRIBED IN TABLE 2. BOXES MARKED WITH AN X REPRESENT A CHARACTER STATE REVERSAL.

	TANGAROA	WAITKERA	POLENECIA	HYPTIOTES	SIRATOBA	ARISTON	MIAGRAMMOPES	SYBOTA	ORINOMANA	ULOBORUS	ZOSIS	PURUM.	OCT.	PONELLA	PHILOPONELLA	DARAMULIANA
32	□	□	□	□	□	□	□	□	□	□	□	▨	□	□	■	▨
31	□	□	□	□	□	□	□	□	□	□	□	□	□	□	■	■
30	□	□	□	□	□	□	□	□	□	□	□	■	□	■	■	■
29	□	□	□	□	□	□	□	□	?	■	■	■	▨	■	■	?
28	□	□	□	□	□	□	□	□	?	□	■	▨	▨	□	□	?
27	□	□	□	□	□	□	□	□	□	■	□	□	□	□	□	□
26	□	□	□	□	□	□	□	■	□	■	▨	▨	▨	▨	▨	▨
25	□	□	□	□	□	□	■	□	□	□	□	□	□	□	□	□
24	□	□	□	□	□	□	■	□	□	□	□	□	□	□	□	□
23	□	□	□	□	□	□	■	■	?	□	□	□	□	□	□	□
22	□	□	□	□	□	□	□	□	?	■	■	■	☒	■	■	?
21	□	□	□	□	□	□	□	□	?	■	■	■	■	■	■	?
20	□	□	□	□	□	□	■	■	■	□	□	□	□	□	□	□
19	□	□	□	■	□	□	□	□	□	□	□	□	□	□	□	□
18	□	□	■	□	□	□	□	□	□	□	□	□	□	□	□	□
17	□	□	■	□	□	□	□	■	□	□	□	□	□	□	□	□
16	□	□	□	■	■	■	■	■	?	■	■	■	■	■	■	?
15	□	□	□	□	■	■	□	□	?	□	□	□	□	□	□	?
14	□	□	□	?	?	□	■	■	■	■	■	■	■	■	■	■
13	□	□	?	□	■	□	■	■	■	■	■	■	■	■	■	■
12	□	■	■	■	■	■	□	□	□	□	□	□	□	□	□	□
11	□	■	□	□	□	□	□	□	□	□	□	□	□	□	□	□
10	□	■	□	□	□	□	□	□	□	□	□	□	□	□	□	□
9	■	□	□	□	□	□	■	□	□	□	□	□	□	□	□	□
8	■	□	□	□	□	□	□	□	?	□	□	□	□	□	□	?
7	■	□	□	□	□	□	□	□	?	□	□	□	□	□	□	?
6	□	■	■	■	■	■	■	■	■	▨	▨	▨	▨	▨	▨	▨
5	□	■	■	■	■	■	■	■	?	■	■	■	■	■	■	?
4	□	■	■	■	■	■	■	■	?	■	■	■	■	■	■	?
3	□	■	■	■	■	▨	☒	☒	?	☒	☒	☒	■	☒	■	?
2	□	■	■	■	■	▨	■	■	?	■	■	■	■	■	■	?
1	□	■	■	▨	■	■	■	■	▨	■	■	■	■	■	■	■



OCT. = OCTONOBA

PURUM. = PURUMITRA

prolateral trichobothria on the fourth femora. It this were the only araneid genus to have such trichobothria their presence might be explained by convergence. However, the tetragnathid genus *Agriognatha* has a single row of trichobothria on the dorsal surface of the first femur, the dorsoretrolateral surface of the second femur, and the prolateral surfaces of the third through fourth femora. The Metinae genus *Alcimosphenus* and *Leucauge argyra* (the latter previously placed in the Metinae genus *Plesiometa*) have dorsal trichobothria on the first femur and two rows of trichobothria on the dorsal surface of the second femur and the prolateral surfaces of the third through the fourth femurs.

Based on the synapomorphic characters of orb-web production and the presence of rows of femoral trichobothria, the family Araneidae appears to be the only family with which Uloboridae may be objectively allied. This hypothesis may be shown false by discovery that these trichobothrial rows are not homologous or that they are shared by members of other families.

The extensive tracheal pattern which I interpret as primitive within the Uloboridae is also found in members of other families and, for this reason, cannot at this time be regarded as a synapomorphic character of uloborids. However, this character does separate Uloboridae from Dinopidae which have a four-branched tracheal system restricted to the abdomen.

Most characters (Table 2) used in the cladistic analysis (Table 3) of generic relationship are discussed above and can also be found in genus descriptions. In the seven cases where two derived states are designated for a character each state is treated as an alternate possibility and designation of a state as "b" in Table 2 does not imply that it was derived from state "a." Ensuing analysis of this data can provide some directional evidence as in the case of Character 6 where "b" appears derived from "a" and Character 26 where "a" and "b" appear independently derived. The structure serving as an embolus guide in haplogyne spiders appears to be homologous with the median apophysis of *Waitkera* (Figs. 28, 29) and, for this reason, I consider presence of a median apophysis a primitive character of uloborids and its absence in *Tangaroa* a derived condition.

Tangaroa is distinguished by derived states of Characters 7, 8, and 9 and the remaining fifteen genera by derived states of Characters 1 through 6. *Waitkera* is the only genus with derived states of Characters 10 and 11 and is united with *Polenecia*, *Hyptiotes*, *Siratoba*, and *Ariston* by the derived state of Character 12. The remaining ten genera share derived states of Characters 13 and 14. *Miagrammopes*, *Sybota*, and *Orinomana* are united by the derived state of Character 20 and the remaining seven genera by derived states of Characters 6, 21, 22, and 29. *Uloborus* is characterized by the derived state of Character 27 and the remaining six genera by Character 26-b. *Zosis*, *Purumitra* and *Octonoba* share the derived state of Character 28 and the remaining three genera share the derived state of Character 30. Other shared, derived characters further define the cladogram presented in Table 3.

Conclusions on relationships of uloborid genera (Table 3) differ from traditional division of the family into three subfamilies and more precisely place the genera. I have chosen not to present a formal classification for the family Uloboridae at this time. I do so not out of disagreement with arguments favoring a well-defined and detailed classification, but out of the belief that this investigation will stimulate additional studies which will test and improve this hypothesis of intrafamilial relationship. Because a cladogram is translated directly into a cladistic classification, lack of a hierarchical scheme does not prevent a clear understanding of the underlying hypothesis of relationship nor preclude its testing.

Uloboridae Thorell

Uloborinae Thorell, 1869, N. Act. Reg. Soc. Sci., Upsalaiensis, (3)7: 1–108 (In Epeiroidae). Type genus *Uloborus* Latreille, 1806.

Uloboridae:—O. Pickard-Cambridge, 1870, Zool. Rec., 7: 207–224.

Diagnosis. Members of the family Uloboridae are distinguished from all other spiders by the lack of poison glands. They are the only cribellate spiders which spin an orb-web, have a row of trichobothria on femora II through IV (Fig. 206), and have a prominent ventral row of macrosetae beginning on the distal half to third of metatarsus IV and extending nearly the full length of tarsus IV (Plate 1-A, C).

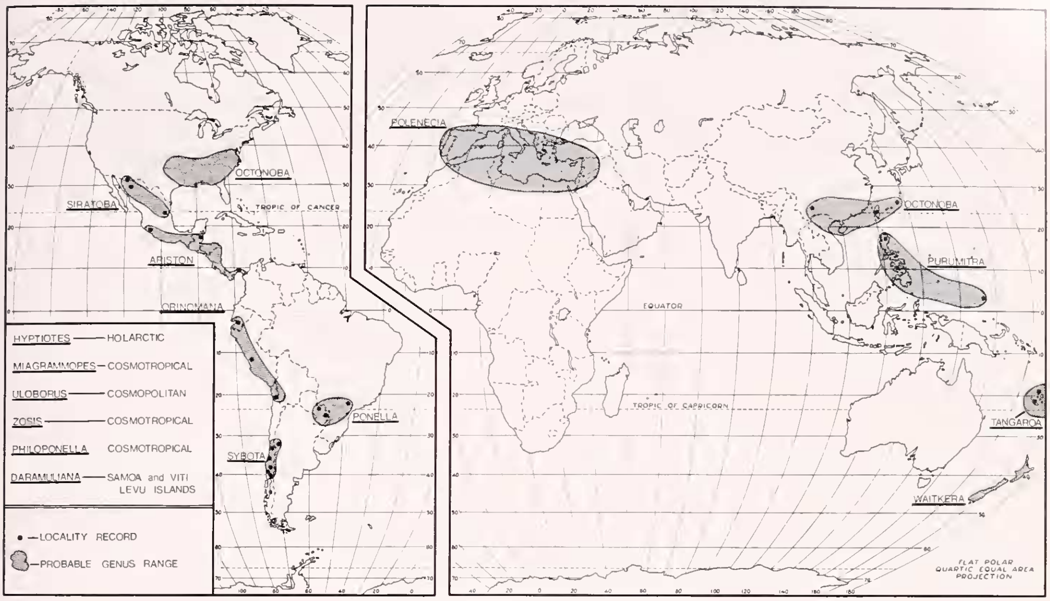
Description. The carapace of most uloborids is oval (Figs. 13, 23, 72) to pear-shaped (Figs. 40, 132, 162), but that of *Hyptiotes* is anteriorly constricted (Fig. 55) and that of *Miagrammopes* nearly rectangular (Figs. 78, 86). In males of some genera the anterior median eyes are situated on a small median mound (Figs. 14, 193). The thoracic groove of females and in many genera of males is a shallow pit (Figs. 13, 14, 40). Males of *Zosis*, *Ponella*, and *Philoponella* have a broad, transverse thoracic groove (Figs. 163, 193, 217). All eyes are nearly equal in size and lack a tapetum. In members of the genus *Tangaroa* anterior lateral eyes are reduced to small pigment spots (Figs. 13, 14) and in members of the genus *Miagrammopes* the anterior eyes are absent (Figs. 78, 80). The eight eyes of the remaining 14 genera are arranged in two rows. When viewed from above the anterior row is procurved in *Polenecia* (Fig. 50), straight in *Hyptiotes* (Fig. 55) and recurved in the remaining genera (Figs. 13, 23, 120). The posterior eye row is nearly straight in *Philoponella* (Figs. 204, 205) and in some *Miagrammopes* (Figs. 78, 80) and recurved in the remaining genera (Figs. 13, 23, 55). Posterior lateral eyes of *Hyptiotes*, *Sybota*, *Orinomana*, and *Miagrammopes* are on conspicuous lateral tubercles (Figs. 55, 78, 79, 100, 121). The sternum of most *Miagrammopes* species is divided (Figs. 81, 82, 92, 93) and in the remaining genera entire, being widest between the first and second coxae (Fig. 164). The labium is not rebordered and, although free from the sternum (Figs. 81, 82, 164), its separation from the latter is not easily discernible in most genera. Endites of *Miagrammopes* species are about twice as long as wide and in others about one-and-one-third times as long as wide. Endite serrulae of all genera are formed by a single row of closely spaced denticles (Plate 7-A). Chelicerae lack a prominent boss and their prolateral and retrolateral fang furrow margins each have a cluster of many small teeth and in some genera one or more larger teeth. Each fang's median surface has a row of small denticles which runs nearly its entire length. Its tip lacks a poison opening. Palpal tarsus of immatures and females each bears an apical serrate claw. The first leg tarsal organ of female representatives of all genera except *Tangaroa*, *Siratoba*, *Orinomana*, *Purumitra*, and *Daramuliana* was examined with the scanning electron microscope and found to be dome-shaped with a central pit (Plate 2-D). The first femur has dorsal trichobothria arranged in one or two rows (Table 3). The second femur has a single row of trichobothria which is proximally dorsal, becoming distally retrolateral (Fig. 206). The third and fourth each have a single row of trichobothria which is proximally dorsal and distally prolateral. Plumose setae are present on legs. Each leg has three tarsal claws, the dorsal two being serrate. Leg formula (longest to shortest): I, IV, II, III. Paired patellar lyriform organs (Plate 2-C) are retrolateral and situated at the proximal margin of a broad, open, weakly sclerotized notch (Figs. 58, 84, 166). In Plate 2-C this weakly sclerotized notch is recognized by the absence of setal sockets.

The fourth metatarsus is laterally compressed in the proximal region which bears the dorsal calamistrum (Plate 1-B, C). Although only one row of calamistral setae is well developed, a prolateral row of short setae (Plate 1-B) adjacent to the primary row betrays the double nature of the calamistrum. A row of stout, nearly perpendicular, ventral setae each with a spiraled shaft and small, hooked tip (Plate 1-A) extends from the center or distal third of the fourth metatarsus to the tip of tarsus IV. Presumably, these setae serve to handle silk during prey wrapping (see Natural History). The pedicel's lorum (Fig. 168) consists of a broad, anterior, shield-shaped plate, a smaller, posterior, H-shaped plate, and a pair of small lateral plates each bearing a lyriform organ (not shown). Abdomen shape is quite variable and ranges from oval (Figs. 24, 40, 42, 56) to peaked (Figs. 74, 122) to cylindrical (Figs. 78, 86). Abdomen of *Polenecia* and *Sybota* have a narrow posterior extension (Figs. 51, 114, 116). The four dorsal humps present in some genera (Figs. 56, 148, 149) appear to correspond to attachment points of the four pairs of dorsal-ventral abdominal muscles. In many genera only one pair of humps is visible (Figs. 120, 122, 132, 195, 260). The heart has three pairs of ostia which in light colored specimens can be seen through the integument (Figs. 40, 98, 133, 159, 195). The cribellum is undivided and bordered anteriorly by a weakly sclerotized region which bears fine setae (Plate 1-D). Cribellum and calamistrum are absent in second instar spiderlings when they emerge from the eggsac as well as in mature males. In males the area previously occupied by the cribellum does not bear a colulus, but has a weakly sclerotized integument similar to that present anterior to a functioning cribellum. Just anterior to the cribellum is a single median spiracle whose broad, shallow atrium gives rise to a pair of lateral chambers, each giving rise to a stout anterior trunk and several smaller posterolateral tracheae (Figs. 1, 2, 3, 5, 7, 9, 11). A more extensive discussion of the tracheal system is found under Intrafamilial Phylogeny. Anterior spinnerets appear to have three segments: a large basal segment; a very short, ringlike middle segment; and a short, dome-shaped apical segment. Median spinnerets have a single segment and posterior spinnerets have two cylindrical segments, the proximal one being longer. The anal tubercle has two segments. A detailed discussion of male and female genitalia appears under Intrafamilial Phylogeny and Map 1 summarizes the distribution of the family's 16 known genera.

Note. Type specimens of *Uloborus minutus* Mello-Leitão and *U. tetramaculatus* Mello-Leitão were not examined during the course of this study. Types of *U. collinus* and *U. trillineatus* described by Keyserling should be housed in Polska Akademia Nauk Instytut Zoologiezny, Warsaw, Poland, but appear to have been lost. *Uloborus formosus* Marx (in Banks) was destroyed in the 1906 California earthquake. The type specimen of *U. niger* Mello-Leitão belongs to the family Dictynidae and the type specimen of *U. ater* Mello-Leitão is an immature male. *Uloborus sexmucronatus* Simon, the type and only known species of Lehtinen's genus *Astavakra* should be housed in the Muséum National d'Histoire Naturelle, Paris, but could not be located. Consequently, this is the only described genus of Uloboridae not treated in this study.

GENERIC KEY FOR ULOBORID MALES
(Males of *Orinomana* are unknown)

1. Posterior lateral eyes (PLE) on prominent lateral tubercles (Figs. 55, 80, 103) 2
– PLE not on lateral tubercles 4
2(1). Anterior eyes absent (Figs. 80, 87); endites and labium at least twice as long as wide (Figs. 82, 92); Cosmotropical .... *Miagrammopes*
– Anterior eyes present (Figs. 55, 103); endites and labium length equal to or less than 1.3 width 3
3(2). Anterior half of carapace conspicuously



Map 1. Distribution of uloborid genera.

narrowed (Fig. 55); in dorsal view anterior median eyes (AME) separated from anterior carapace edge by at least two eye diameters (Fig. 55); length of femur I equal to carapace length; median ocular quadrangle four times as wide posteriorly as anteriorly; Holarctic and Oriental (Map 1) .... *Hyptiotes*

– Carapace oval (Fig. 103); in dorsal view AME at anterior edge of carapace (Fig. 103); length of first femur 1.5 to 1.7 times carapace length; median ocular quadrangle 1.5 to 2.0 times as wide posteriorly as anteriorly; western South America (Map 1) .... *Sybota*

4(1). Anterior median eyes (AME) on a conspicuous anterior projection (Fig. 14); ALE absent, represented only by small, dark spots; first femur with a distal crook (Fig. 21); South Pacific islands (Map 1) .... *Tangaroa*

– AME not on a conspicuous projection; ALE present; femur I without a distal crook 5

5(4). Palpus with a large, dome-shaped median apophysis bulb and a small, claw-shaped median apophysis spur (Plate 7-A–C) 6

– Palpus otherwise; median apophysis bulb flattened (Plates 6-C, D, 7-D; Figs. 28, 46, 47, 157), reduced (Plate 3-C, D; Figs. 68, 69), or median apophysis is a long projection (Plate 3-A, B) 9

6(5). Palpus without a conductor and with a broad, flat tegular spur serving as an embolus guide (Plate 7-C); first femur (Fig. 167) with one prolateral and three dorsal macrosetae; cosmotropical .... *Zosis*

– Palpus with a conductor and without a tegular spur (Plate 7-A, B; Figs. 201, 218, 253, 270); first femur with two or three prolateral, one or two retrolateral, and two dorsal macrosetae (Fig. 202) 7

7(6). Palpus with a large conductor extending along the distal embolic surface and having a long, thin projection at its base (Fig. 201); first tibia with three prolateral, three retrolateral, and four dorsal macrosetae (Fig. 202); southeastern South America (Map 1) .... *Ponella*

– Palpus either without a conductor along the distal embolic surface (Plate 7-A) or if conductor is longer it consists of a basal lobe and a long conductor spur (Plate 7-B); first tibia with at least four prolateral, four retrolateral, and six distal macrosetae 8

8(7). Carapace oval with a broad, transverse thoracic groove (Fig. 217); posterior eye row nearly straight; clypeus height in anterior view 0.7 to 1.5 AME diameter; conductor spur present (Plates 7-B; Figs. 218, 236); first femur without numerous trichobothria; cosmotropical .... *Philoponella*

– Carapace pear-shaped with conspicuously narrowed cephalic region and a narrow thoracic depression (Figs. 133, 142); posterior eye row recurved such that a line touching PMEs' posterior margins passes anterior to the PLEs by half a PLE diameter; clypeus height half an AME diameter; conductor spur absent (Plate 7-A; Figs. 135, 143); first femur with numerous trichobothria (Fig. 131); cosmo-politan .... *Uloborus*

9(5). Median apophysis spur a broad, concave or enrolled sclerite (Plates 6-C, D; 7-D); tegular spur usually present (Plates 6-C, 7-D) 10

– Palpus otherwise 11

10(9). Male carapace length greater than 1.4 mm; length of first femur 1.5 to 1.7 that of carapace; median apophysis bulb reduced, median apophysis spur concave (Plates 6-C, D, 7-D); southeastern United States, China and adjacent Pacific islands (Map 1) .... *Octonoba*

– Carapace length less than 0.9 mm; length of first femur twice that of carapace; median apophysis bulb large and laterally flattened; median apophysis spur broad with a central depression (Fig. 157); Pacific islands (Map 1) .... *Purumitra*

11(9). Embolus short, pointed, and free from guide for most of its length (Figs. 28, 29, 46, 47); cymbium with two or three short, stout apical macrosetae; each endite's lateral surface with a lobe bearing stridulatory ridges (Figs. 28, 46, 47) 12

– Embolus either broad and flat (Plate 3-A B) or resting in a grooved radix (Plate 3-C, D; Figs. 68, 69); cymbium without such spines; endite lacks a lateral lobe and stridulatory file 13

12(11). Anterior eye row recurved (Fig. 23); first tibia with six prolateral, two retrolateral, six dorsal, and no ventral macrosetae (Fig. 27); cymbium with three stout distal marginal macrosetae (Fig. 28); palpus with a pointed, grooved median apophysis serving as an embolus guide and with a long thin radix (Figs. 28, 29); New Zealand (Map 1) .... *Waitkera*

– Anterior eye row procurved (Fig. 50); first tibia with two prolateral, two retrolateral, one dorsal, and six ventral macrosetae (Fig. 49); cymbium with two stout distal, marginal macrosetae and a thin distal cymbial extension (Figs. 46, 47); palpus with a thin proximal median apophysis lobe and a broad flat conductor with a thin apical lobe together as a guide; radix not conspicuous (Fig. 46, 47); Mediterranean (Map 1) .... *Polenecia*

13(11). Radix a thin, broad sclerite, bifurcate at its tip and not surrounding embolus (Plate 3-A, B); PME at least twice as far from one another as from PLE (Fig. 41); total length about 1.4 mm; southern Mexico through Central America (Map 1) .... *Ariston*

– Radix a large, coiled sclerite whose grooved inner surface holds the embolus (Plate 3-C, D; Figs. 68, 69); PME 1.0 to 1.5 times as far from one another as from the PLE (Fig. 72); total length about 2.7 mm; southwestern United States and central Mexico (Map 1) .... *Siratoba*

GENERIC KEY FOR ULOBORID FEMALES

1. Abdomen with a prominent posterior projection extending beyond spinnerets (Figs. 51, 102, 116) 2

– Abdomen without such a posterior projection (Figs. 15, 24, 56, 74, 122, 197) 3

2(1). Posterior lateral eyes (PLE) near carapace border on prominent lateral tubercles (Figs. 100, 115); anterior eye row recurved when viewed dorsally; epigynum without a midventral posterior projection (Figs. 105, 112, 117); Chile (Map 1) .... *Sybota*

– PLE not near carapace border and not on lateral tubercles (Fig. 50); anterior eye row procurved when viewed dorsally; epigynum with a midventral posterior projection (Figs. 52, 53); Mediterranean (Map 1) .... *Polenecia*

3(1). Anterior eyes lacking (Fig. 78); endites and labium at least 1.5 times as long as wide (Figs. 81, 92); cosmotropical .... *Miagrammopes*

– Anterior eyes present, although anterior lateral eyes (ALE) may be reduced; length of endites and labium 1.3 or less their width (Fig. 164) 4

4(3). ALE reduced, represented only by dark pigment spots (Fig. 13); genital area when viewed ventrally a low, weakly sclerotized mound (Fig. 16); South Pacific islands (Map 1) .... *Tangaroa*

– ALE present; genital area either weakly sclerotized with a central peak and a posteromedian groove (Fig. 30) or distinctly modified and (usually) well sclerotized (Figs. 32, 59, 65, 169, 178, 198, 208, 236) 5

5(4). Posterior lateral eyes (PLE) on distinct lateral tubercles (Figs. 23, 55, 121) 6

– PLE not on distinct lateral tubercles (Figs. 72, 175, 186, 192) 8

6(5). Anterior half of carapace conspicuously narrower that posterior half (Fig. 55); anterior eye row straight; median ocular area's anterior border one-fourth the width of its posterior border; length of first femur less than that of carapace; Holarctic; Oriental (Map 1) .... *Hyptiotes*

– Carapace oval or pear-shaped (Figs. 23, 121); anterior eye row recurved; median ocular area's anterior border three-fifths to five-sixths as wide as its posterior border; length of first femur at least 1.4 that of carapace 7

7(6). Anterior eye row recurved such that a line across the anterior median eyes' (AMEs') posterior margins passes along the ALEs' anterior border (Fig. 23); in dorsal view the clypeus does not project anteriorly; abdomen rounded in lateral view (Fig. 24); genital area a weakly sclerotized mound with a central peak and a posteromedian notch (Fig. 30); New Zealand (Map 1) .... *Waitkera*

– Anterior eye row recurved such that a line across the AMEs' posterior margins passes through the anterior third of ALE (Fig. 121); in dorsal view the clypeus extends anteriorly a distance equal to one AME diameter; abdomen peaked in lateral view (Fig. 122); epigynum well sclerotized, flattened, and with a posterior indentation (Figs. 123, 126); western South America (Map 1) .... *Orinomana*

8(4). Epigynum with a pair of posterolateral lobes (Figs. 137, 154, 178, 184, 198) 9

– Epigynum with one or more ventral atria (Figs. 160, 189, 208, 239, 250) or with a posteriorly directed median projection (Figs. 32, 36, 43, 65, 75).................... 12

9(8). Posterior eye row recurved such that a line across the posterior median eyes' (PMEs') posterior margins passes along or anterior to the PLEs' anterior margins (Figs. 132, 175); posterior epigynal lobes slender and their bases contiguous (Figs. 137, 154, 178, 184).......................... 10

– Posterior eye recurved so that such a line passes through the center of the PLEs (Figs. 162, 192); posterior epigynal lobes broad and their bases separated by a distance equal to the width of each (Figs. 169–171, 198, 199) 11

10(9). Posterior eye row recurved such that a line across the PMEs' posterior margins passes along the PLEs' anterior margins (Fig. 175); width of cephalic region at the ALEs two-thirds the maximum carapace width (Fig. 175); median ocular area's anterior width and length 0.7 its posterior width; epigynum's posterior surface with a conspicuous atrium or pair of lateral atria (Figs. 179, 185); United States and China and adjacent Pacific islands (Map 1) .... *Octonoba*

– Posterior eye row recurved so that such a line passes anterior to the PLEs by a distance equal to at least one-fourth a PLE diameter (Figs. 132, 148); cephalic region at ALE half the carapace width; median ocular area square; epigynum's posterior surface without conspicuous atria (Figs. 138, 146); cosmopolitan .... *Uloborus*

11(9). Epigynum with two low, rounded posterolateral mounds anterior to which the openings are found (Figs. 198, 199); total length less than 4 mm, southeastern South America (Map 1) .... *Ponella*

– Epigynum with two flattened, ventrally or posteriorly directed lobes whose ventrolateral surfaces each bear a triangular sclerite and whose posterior surfaces form lateral atria in which openings are found (Figs. 169–171); total length greater than 6 mm; cosmotropical.......... *Zosis*

12(8). Epigynum with a single median, ventral atrium (Figs. 32, 36, 43, 65, 75, 208, 239, 250, 266, 275) 13

– Epigynum with two or more atrial divisions (Figs. 160, 189) 15

13(12). Epigynum with a ventral atrium (Figs. 208, 239, 250, 266, 275); total length 2.9 mm or greater; posterior eyes about equally spaced (Figs. 216, 260); cosmotropical .... *Philoponella*

– Epigynum with a ventromedian projection extending over a posterior atrium (Figs. 32, 43, 65, 75) or if median projection is less distinct (Fig. 36) total length 2.5 mm or less and PME three times as far from one another as from PLE (Figs. 40, 41) 14

14(13). Carapace length and width equal (Fig. 41); PME 2.5 to 3.0 times further from one another than from PLE (Figs. 40, 41); clypeus height in anterior view half or less an AME diameter; total length less than 2.5 mm; epigynum without a distinct posterior plate (Figs. 33, 37, 44); southern Mexico through Central America (Map 1) .... *Ariston*

– Carapace 0.8 times as wide as long (Fig. 72); posterior eyes about equally spaced (Figs. 71, 72); clypeus height 0.8 to 1.0 AME diameter, total length 3.0 mm or greater; epigynum with a distinct posterior plate (Figs. 66, 76); southwestern United States and central Mexico (Map 1) .... *Siratoba*

15(12). Epigynum with two lateral atria (Fig. 189); median ocular area's anterior width half its posterior width (Fig. 186); carapace three-fourths as wide as long; total length 4.0 to 4.6 mm; Australia and Pacific islands (Map 1) .... *Daramuliana*

– Epigynum with an anterior and posterior median atrium, each divided by a median septum, and a pair of anterior and posterior lateral atria (Fig. 160); median ocular area nearly square (Fig. 159); carapace width and length equal; total length about 3.0 mm; Pacific islands (Map 1).... .... *Purumitra*

Tangaroa Lehtinen

Figures 13–22, Map 1

Tangaroa Lehtinen, 1967, Ann. Zool. Fennici, 4: 199–468. Type species by original designation *Uloborus tahitiensis* Berland, 1934, Ann. Soc. ent. France, 103: 321–336. Male holotype and 3 female paratypes in Muséum National d'Histoire Naturelle, Paris, examined. The genus name is feminine.

Diagnosis. Males and females are distinguished from those of all other genera by lack of ALE (Figs. 13, 14). Males also differ from those of other genera by presence of: 1. AME on an anterior projection (Fig. 14), 2. a distal crook in femur I (Fig. 21), and 3. a palpus with a folded cymbial tip and only a flattened embolus (Fig. 19). Females are also differentiated by weakly sclerotized genitalia in the form of a low mound (Figs. 16, 17).

Description of Type Species. Total length of female 4.6 to 5.6 mm. Carapace 0.85 times as wide as long. In lateral view cephalic region rises slightly from shallow thoracic depression to PME. In females it then slopes downward and in males upward to AME. Thoracic region slopes gradually to the petiole. Male and female ALE absent, represented only by darkly pigmented areas (Figs. 13, 14). At AME carapace width 0.35 its maximum width. Male AME on conspicuous, anterodorsal projection (Fig. 14). Posterior eye row recurved such that line across posterior margins of PME passes anterior to PLE. Median ocular area in females nearly square (slightly wider than long) (Fig. 13) and in males trapezoidal, anterior edge slightly wider than posterior edge and length slightly less than posterior width (Fig. 14). In anterior view clypeus height of females equal to AME diameter and of males 2.0 to 2.5 times AME diameter. Female sternum two-thirds and male sternum four-fifths as wide as long. Female palpal femur laterally flattened and calamistrum one-third as long as metatarsus IV. Female first femur 2.1 times and male first femur 1.9 times carapace length. Male first femur bears four dorsal, four prolateral, and three retrolateral macrosetae. Tibia I bears seven dorsal, eight ventral, five prolateral, and five retrolateral macrosetae. Distal third of the male first tibia forms a crook whose concave ventral surface bears stout macrosetae at its posterior margin (Fig. 21). Abdomen width and height about half its length (Fig. 15). Two stout tracheal trunks extend into cephalothorax.

Male palpus. Endite with a small, lateral stridulatory file just dorsal to serrate edge (Fig. 19). Two macrosetae on distal, median surface of cymbium serve as picks. Femur lacks ventral tubercles. Cymbium large, its broad distal portion folded laterally, apparently serving as guide for embolus. Within this broad fold and near the embolus' base is a dark, oval region which close examination shows to be part of the heavily sclerotized sperm duct and not a median apophysis (Fig. 19, 20). No middle hematodocha is present. Unlike other uloborids, the embolus is flattened and is not closely associated with a guide.

Genital Region. In ventral view this region appears as a lightly sclerotized, convex shield (Fig. 16). In posterior view its central, unsclerotized region has two median openings (Fig. 17), each leading to a pair of lobed spermathecae (Fig. 18). No fertilization duct leads from either spermatheca.

Natural History and Distribution. In

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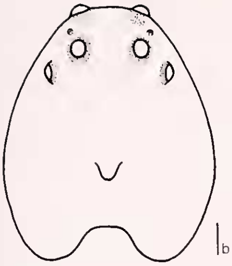
Figures 13–22. *Tangaroa tahitiensis* (Berland). 13. Dorsal view of female carapace. 14. Dorsal view of male carapace. 15. Lateral view of female abdomen. 16. Ventral view of female genitalia. 17. Posterior view of female genitalia. 18. Dorsal view of cleared female genitalia. 19. Retrolateral view of left male palpus. 20. Retrolateral view of embolus (black), sperm reservoir, and fundus. 21. Prolateral view of male left, first femur, patella, and tibia. 22. Dorsal view of female right first femur showing trichobothria. Figures 23–27. *Waitkera waitkerensis* (Chamberlain). 23. Dorsal view of female carapace. 24. Lateral view of female abdomen. 25. Lateral view of female carapace. 26. Dorsal view of female right first femur. 27. Prolateral view of male left first femur, patella, and tibia.



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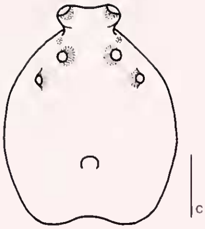

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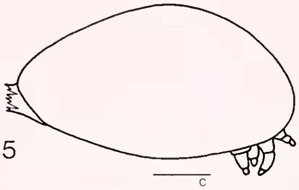

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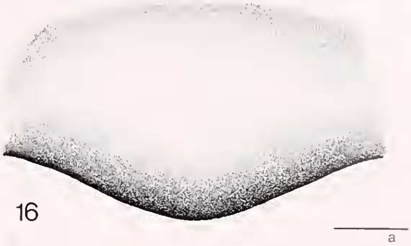

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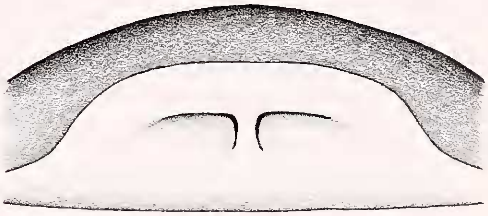

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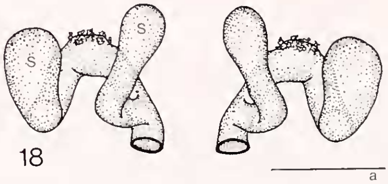

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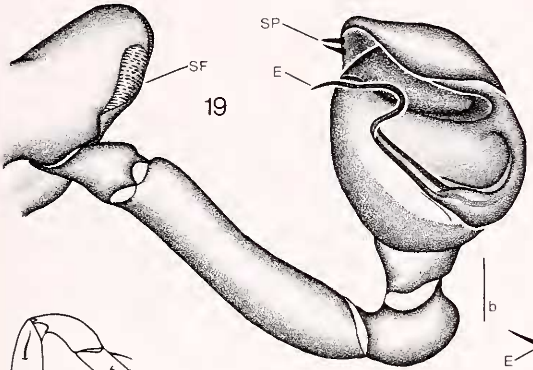

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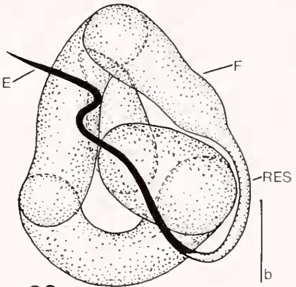

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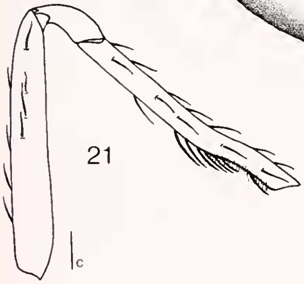

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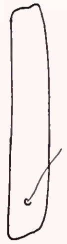

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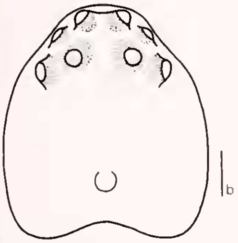

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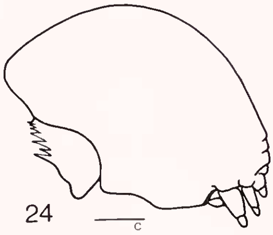

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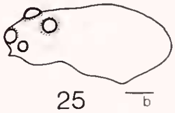

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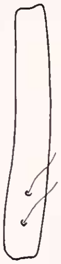

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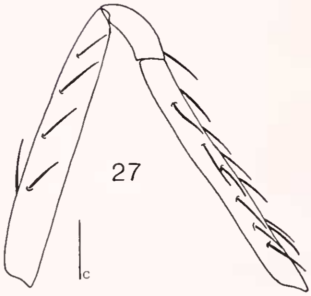

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addition to the type species found on Tahiti in the Society Islands and Rapa in the Tubuai Islands, this genus contains *Tangaroa* (*Uloborus*) *dissimila* (Berland, 1924), found on New Caledonia and the New Hebrides island of Epi (Map 1). Webs of neither species are known.

Waitkera new genus
Figures 23–31, Map 1

Tangaroa [part]:—Lehtinen, 1967, Ann. Zool. Fennici, 4: 199–468.

Type. Type species *Uloborus waitkerensis* Chamberlain, 1946, Rec. Auckland Inst. Mus., 3(2): 85–97. Female holotype and three paratypes from Watershed Reservoir, Waitker Hills, Auckland, New Zealand collected by G. Chamberlain. Holotype and one paratype in G. Chamberlain collection, two paratypes in Auckland Museum. The genus name is feminine and is derived from the locality of the type species.

Diagnosis. Like *Sybota* and *Orinomana*, *Waitkera* females have PLE on distinct lateral tubercles (Fig. 23). Unlike *Sybota* (Figs. 102, 114, 116) the abdomen of *Waitkera* (Fig. 24) does not have a prominent posterior extension and unlike *Orinomana* (Figs. 120, 122), it is not peaked. Posterior eye row of *Waitkera* males and females only slightly recurved such that a line across PMEs' posterior margins passes through PLEs' centers (Fig. 23). In *Sybota* (Figs. 100, 115) and *Orinomana* (Fig. 121) (males of the latter are unknown) such a line passes along PLEs' anterior borders or through anterior one-fourth of their diameters. First femur of *Waitkera* males and females twice as long as carapace, in *Sybota* and *Orinomana* 1.3 to 1.7 times carapace length. Genitalic region of *Waitkera* females (Fig. 30) a weakly sclerotized mound, that of *Sybota* (Figs. 105, 112, 117) and *Orinomana* (Figs. 123, 126) well sclerotized. Male palpus of *Waitkera* (Figs. 28, 29) has flattened, pointed median apophysis serving as embolus guide; prominent radix, and three short, stout marginal cymbial macrosetae. Palpus of *Sybota* (Plate 6-A, B) has well-developed conductor, two- or three-pronged median apophysis, and lacks radix.

Description. Male total length 2.9 mm, carapace length 1.1 mm, and sternum length 0.7 mm. Female total length 3.5 mm, carapace length 1.1 mm, and sternum length 0.7 mm. Carapace width equal to length. Cephalic region rises slightly from thoracic depression and thoracic region slopes gradually to petiole (Fig. 25). At ALE cephalic region three-fifths carapace width (Fig. 23). Both eye rows recurved, posterior such that a line across posterior margins of PME passes through center of PLE. Lateral eyes on slightly raised tubercles. Median ocular area five-sixths as wide anteriorly as posteriorly and as long as its anterior width. Clypeus height in anterior view equal to one AME diameter. Sternum 0.64 as wide as long in females and 0.71 in males. Female palpal femur not laterally compressed. Female first femur 1.9 times carapace length, male first femur 2.1 times carapace length. Female calamistrum half as long as metatarsus IV. Male first femur with two dorsal, four prolateral, and three retrolateral macrosetae (Fig. 27). First tibia with six dorsal, six prolateral, and two retrolateral macrosetae. Female abdomen two-thirds as wide and five-sixths as high as long (Fig. 24); maximum width and height attained half way along length. Male abdomen cylindrical, half as wide and high as long. Carapace gray with broad light lateral margins and narrow median stripe extending from thoracic pit through median ocular area. Endites, labium, and sternum gray,

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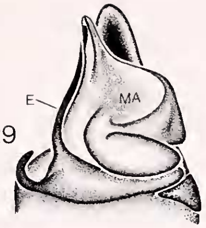
Figures 28–31. *Waitkera waitkerensis* (Chamberlain). 28. Retrolateral view of left male palpus. 29. Dorsolateral view of distal region of left male palpus. 30. Ventral view of female genitalia. 31. Dorsal view of cleared female genitalia. Figures 32–34. *Ariston albicans* (O. Pickard-Cambridge). 32. Ventral view of female genitalia. 33. Posterior view of female genitalia. 34. Dorsal view of cleared female genitalia. 35. Dorsal view of first female femur. Figures 36–38. *Ariston mazolus* n. sp. 36. Ventral view of female genitalia. 37. Posterior view of female genitalia. 38. Dorsal view of cleared female genitalia.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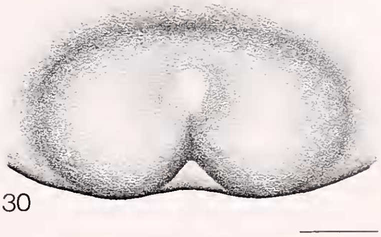
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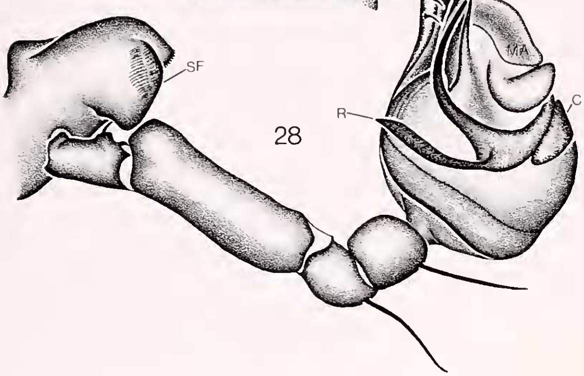
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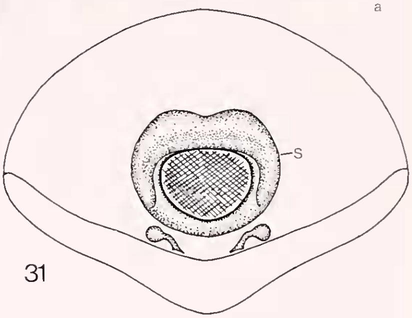
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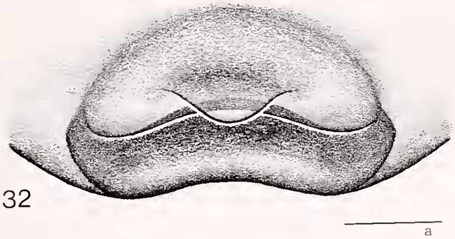
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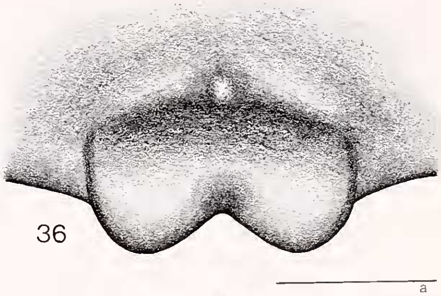
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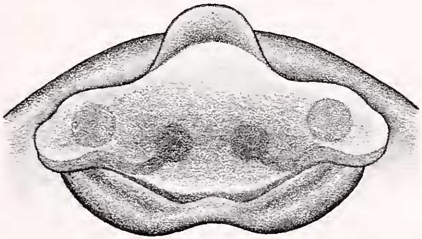
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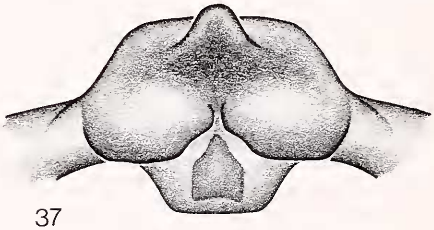
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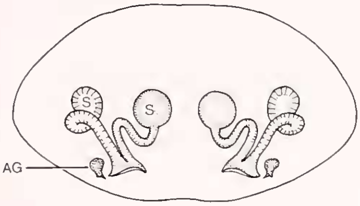
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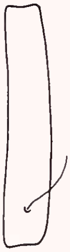
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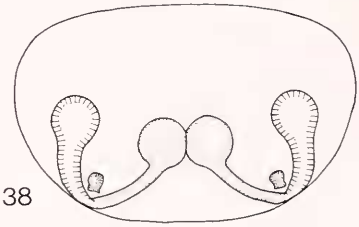
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the latter with narrow white median stripe. Tibiae gray with wide white proximal and median rings. Dorsum of abdomen white with five to six posteromedian gray chevrons. Sides with transverse, light gray stripes. Venter of abdomen gray with white book lung covers, white paraxial stripes just behind epigastric furrow, and three pairs of white spots just anterior to cribellum. Two stout tracheal trunks extend into cephalothorax.

Male Palpus. Lateral lobe on each endite bears stridulatory ridges (Fig. 28). Three stout macrosetae on posterodistal cymbial rim serve as picks. There are no ventral femoral tubercles or middle hematodocha. Short, curved embolus lies in trough on posterolateral face of flat, distal median apophysis lobe (Figs. 28, 29). Smaller, proximal median apophysis lobe lies between distal lobe and embolus base.

Female Genitalia. Genitalic area not heavily sclerotized (Fig. 30), consisting of ventral mound with central peak and posterior notch. Chamberlain (1946) describes an epigynal opening at each dorsal margin of this notch, but these appear to be openings of small, blind lateral bulbs (Fig. 31). Large, blind, spherical, median spermatheca opens only into the vagina through broad, hood-shaped opening. Implications of this haplogyne (*sensus* Wiehle, 1967) condition are discussed under phylogeny.

Natural History and Distribution. The single known species in this genus constructs small orb-webs among shrubs and grass (Forster, 1967) and is known only from New Zealand (Map 1).

Ariston O. Pickard-Cambridge

Figures 32–45, Plate 3-A, B; Map 1

Ariston O. Pickard-Cambridge, 1896, Bio. Cent.-Amer., Zool., Arachnida, 1: 161–224. Type species by monotype *Ariston albicans* O. Pickard-Cambridge, 1896, *ibid.* The generic name is masculine.

Note. The small, generalized uloborids which have been placed in *Ariston* appear to form two distinct genera, separated by differences in eye arrangement and features of male and female genitalia. In addition to *A. albicans* the now-restricted genus *Ariston* contains two new species, *A. aristus* and *A. mazolus. Ariston referens* and a new species have been placed into the new genus *Siratoba*.

Diagnosis. Ariston is the only known uloborid genus with mature females having a total length of less than 2.5 mm and, besides *Siratoba* (Figs. 65, 75), the only American genus whose members have a posterior epigynal hood (Figs. 32, 36, 43). In *Ariston* the posterior atrium formed by this hood lacks the prominent posterior plate found in members of *Siratoba* (Figs. 66, 76). *Ariston* is found from southern Mexico through Central America and *Siratoba* has been collected only from southwestern United States and central Mexico. In *Ariston* (as compared with *Siratoba*) females, PMEs separated by a distance at least two (Fig. 41) (in *Siratoba* no more than one-and-one-half, Fig. 72) times that separating AMEs, PME separation two-and-one-half to three (one-and-one-half in *Siratoba*) times that of the PME-PLE separation, PME and PLE mounds are confluent (in *Siratoba* separate) in anterior view, clypeus height equal to or less than half (in *Siratoba* four-fifths to one) AME diameter, carapace length and width about equal (in *Siratoba* carapace 0.80 as wide as long), first femur 1.8–2.0 (in *Siratoba* 1.5) times carapace length, and abdomen oval (Figs. 40, 42) (in *Siratoba* with middle peak, Figs. 71, 74), three-fourths (in *Siratoba* half) as wide and three-fourths as high as long. The only known males

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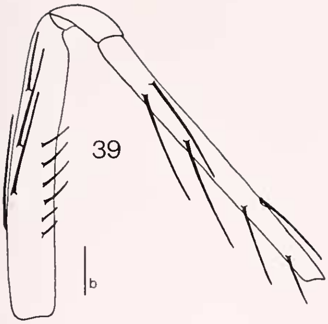
Figure 39. *Ariston mazolus* n. sp., prolateral view of male left first femur, patella, and tibia. Figures 40–45. *Ariston aristus* n. sp. 40. Dorsal view of female. 41. Female carapace. 42. Lateral view of female abdomen. 43. Ventral view of female genitalia. 44. Posterior view of female genitalia. 45. Dorsal view of cleared female genitalia. Figures 46–49.



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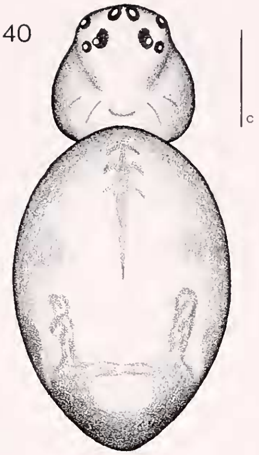

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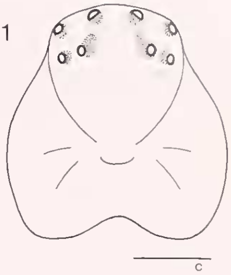

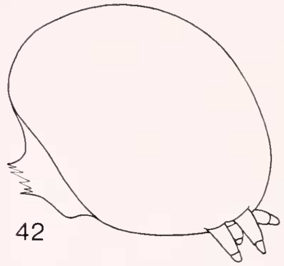

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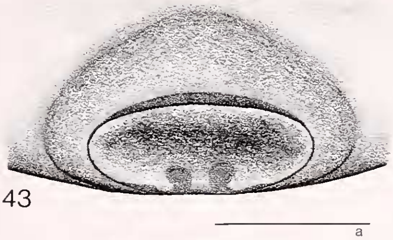

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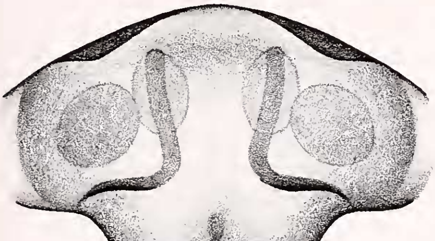

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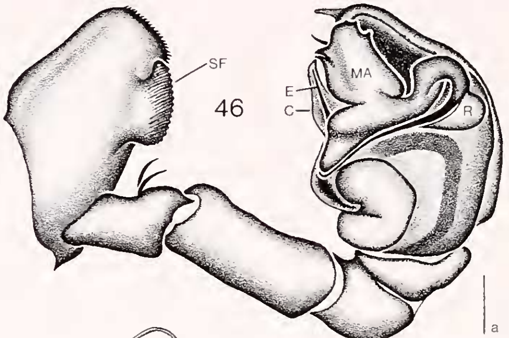

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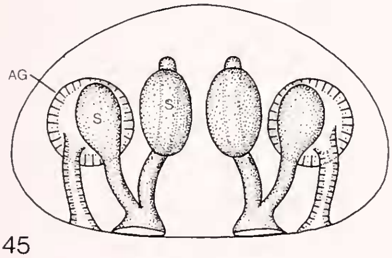

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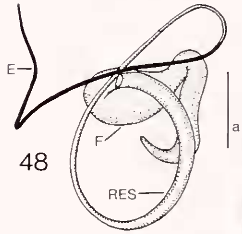

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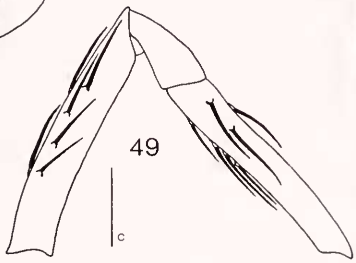

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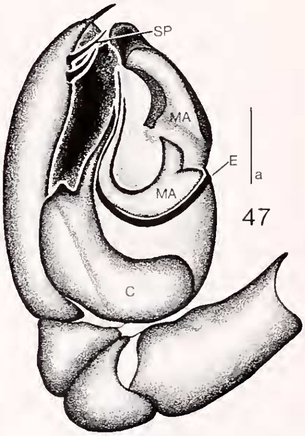

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Polenecia producta (Simon). 46. Retrolateral view of left male palpus. 47. Prolateral view of left male palpus. 48. Retrolateral view of embolus (black), sperm reservoir, and fundus. 49. Prolateral view of male, left, first femur, patella and tibia.

belong to *A. mazolus* and are distinguished as the smallest adult male uloborids known (total length less than 1.4 mm) and the only known uloborid males to have a series of six ventroprolateral macrosetae on femur I (Fig. 39), a bifurcate radix (Plate 3-A, B), and a short, flat embolus with a blunt tip.

Description. Carapace width and length equal. Cephalic region rises slightly from shallow thoracic depression, at level of ALE is about 0.6 carapace width. Both eye rows about equally recurved such that a line across posterior margin of median eyes passes along anterior margin of lateral eyes (Fig. 41). Median ocular area about as wide anteriorly as posteriorly and about four-fifths as long as its anterior width. In anterior view, clypeus height of females half or less AME diameter and in males one-and-one-half times AME diameter. Sternum width about 0.68 length. Female palpal femur laterally flattened. Female first femur about 1.8–2.0 times carapace length. Female calamistrum half the length of metatarsus IV. Male first femur with six ventroprolateral, three dorsoprolateral, one dorsoproximal, and three retrolateral macrosetae (Fig. 39). Male first tibia has one prolateral, three retrolateral, one or two dorsal, and four ventral macrosetae. Female abdomen oval, height and width three-fourths length (Figs. 40, 42). Male abdomen cylindrical with diameter half its length. A pair of stout tracheal trunks extends into cephalothorax.

Male Palpus. Palpal femur lacks ventral tubercles and tarsus has an apparently reduced middle hematodocha. Median apophysis a heavily sclerotized, elongate projection with foot-shaped terminus that appears to support the short, broad, blunt embolus (Plate 3-A, B). Flat, curved radix arises proximal to embolus and terminates in two pointed prongs. Conductor arises between bases of median apophysis and radix and extends between distal portions of these sclerites.

Female Genitalia. A posteroventral hood of various widths (Figs. 32, 36, 43) extends over dorsal atrium in which openings are found (Figs. 33, 37, 44). Each opening leads to a pair of apparently blind spermathecae, the lateral pair usually having thicker walls than the median pair (Figs. 34, 38, 45). Lateral to spermathecal ducts is a pair of small (*A. albicans* and *A. mazolus*, Figs. 34 and 38, respectively) or large (*A. aristus*, Fig. 45) accessory glands which appear to have separate openings and to be homologous with those of *Waitkera*, *Polenecia*, *Hyptiotes*, and *Siratoba*.

Natural History and Distribution. The three species in this genus are found from southern Mexico through Central America (Map 1). Nothing is known of their web structure.

KEY TO *ARISTON* FEMALES

(Males are known only for *A. mazolus*)

1. Genitalia with a thin, anterior, overhanging rim about three-fourths as wide as the raised genital area; in ventral view posterior genital margin rounded (Fig. 43); Panama .... *aristus*

– Genitalia with a prominent median projection about one-fourth to one-third its width and forming a hood; in ventral view posterior genital margin indented (Figs. 32, 36); southern Mexico to Honduras 2

2(1). Genital hood one-third the genital region's width; in ventral view this region's posterior margin has a slight median depression (Fig. 32) as does its dorsal margin when viewed posteriorly (Fig. 33); clypeus height one-fourth or less the AME diameter; southeastern Mexico and Honduras .... *albicans*

– Genital hood one-fourth the genital region's width; in ventral view this region's posterior margin has two lateral lobes separated by a deep median depression (Fig. 36) and in posterior view these lobes are separated by a deep notch (Fig. 37); clypeus height half or less the AME diameter; southwestern Mexico .... *mazolus*

Ariston albicans O. Pickard-Cambridge

Figures 32–35

Ariston albicans O. Pickard-Cambridge, 1896, Bio. Cent.-Amer., Zool., Arachnida, 1: 161–224. Three female syntypes from Teapa in the Mexican state of Tabasco, collected by H. H. Smith, in the British Museum (Natural History), examined.

Diagnosis. *Ariston albicans* females are distinguished from those of *A. aristus* by having a genital hood which is one-third (Figs. 32, 33) rather than three-fourths (Figs. 43, 44) the genital area's width, by this hood forming a prominent posteroventral projection rather than a thin anterior margin of a broad atrium, and by having an indented rather than rounded posterior genital margin when viewed ventrally. Accessory glands are one-third (Fig. 34) rather than one-and-one-half (Fig. 45) a spermathecal diameter. *Ariston albicans* females differ from those of *A. mazolus* by having a genital hood which is one-third (Fig. 32) rather than one-fourth (Fig. 36) the genital area's width and by having shallow rather than deep posterior and dorsal epigynal indentations when viewed ventrally (Figs. 32, 36) and posteriorly (Figs. 33, 37) respectively. Spermathecal ducts are looped (Fig. 34) rather than straight (Figs. 38, 45).

Description. Only females are known. Total length 2.1 to 2.2 mm, carapace length 0.7 mm, sternum length 0.5 mm. Clypeus height one-tenth to one-fourth AME diameter. Coloration similar to that of *A. aristus* (Fig. 40). Carapace, sternum and legs light tan. Dorsum of abdomen white, with tan median cardiac region; broad, posterior tan paraxial stripes and a pair of tan spots just posterior to abdomen's center. From the center of the genitalia's ventral surface a narrow, flat, dorsally concave hood projects posteriorly (Fig. 32). In ventral view (Fig. 32) genital area's posterior edge slightly emarginate. In posterior view (Fig. 33) genitalia's broad, central region is concave and its dorsal edge bordered by a thin, heavily sclerotized, medially emarginate rim. A genital opening is found at each ventrolateral margin of this dorsal rim and leads to a short bursa from which a pair of looped ducts originates. Each duct connects to an apparently blind spermatheca, the lateral one having thicker walls than the median one (Fig. 34). Lateral to the bursae is a pair of small, blind accessory glands.

Distribution. Southeastern Mexico and Honduras.

Ariston mazolus n. sp.
Figures 36–39, Plate 3-A, B

Types. Female holotype and three male paratypes from Miramar, Manzanillo in the Mexican state of Colima, collected on 15 January 1943 by F. Bonet, in the American Museum of Natural History. The specific epithet is an arbitrary combination of letters.

Diagnosis. The only known males of *Ariston* belong to this species and are diagnosed in the generic treatment. Females are distinguished from those of *A. aristus* by having a median genital projection which is one-fourth (Fig. 36) rather than three-fourths (Fig. 43) the genital area's width and by having an indented rather than smooth posterior genital margin when viewed ventrally. Accessory glands one-third (Fig. 38) rather than one-and-one-half (Fig. 45) spermathecal diameter. *Ariston mazolus* females differ from those of *A. albicans* by having a genital hood one-fourth (Fig. 36) rather than one-third (Fig. 32) the genital area's width, by having deep rather than shallow posterior and dorsal genital indentations when viewed ventrally (Fig. 36) and posteriorly (Fig. 37) respectively. Spermathecal ducts straight (Fig. 38) rather than looped (Fig. 34).

Description. Male. Total length 1.4 mm, carapace length 0.6 to 0.7 mm, sternum length 0.4 mm. Carapace, sternum, and legs tan. Abdomen with white dorsum and gray venter. Other features of the male given in the genus description.

Female. Total length 2.0 mm, carapace length 0.6 mm, sternum length 0.4 mm. Clypeus height half AME diameter. Coloration similar to that of males. Genitalia's anteroventral region forms a rounded ridge with an abrupt narrow median projection whose posterior surface is concave (Fig. 37). In posterior view a pair of lateral lobes separated by a deep median notch is found dorsal to this projection (Fig. 37). Dorsal to these lobes is a median lobe with a more heavily sclerotized central region. A genital opening located dorsolateral to each lateral lobe leads via two ducts to a thick-walled lateral and a thin-walled median spermatheca (Fig. 38). Near the bifurcation of these ducts a small accessory gland is found.

Distribution. Known only from the type locality in southwestern Mexico.

Ariston aristus n. sp.
Figures 40–45

Types. Female holotype and paratype from Barro Colorado Island, Panama Canal Zone. Holotype collected August 1939 by A. M. Chickering, paratype 20–24 June by N. Banks, both in the Museum of Comparative Zoology. The specific epithet is an arbitrary combination of letters.

Diagnosis. Females are distinguished by a broad, posteroventral genital atrium bordered anteriorly by a narrow rim three-fourths the genital area's width (Fig. 43). In ventral view (Fig. 44) genitalia's posterior edge gently rounded and not emarginate as in other two species. Accessory glands of *A. aristus* one-and-one-half the spermathecal diameter (Fig. 45) rather than one-third the diameter as in the other two species (Figs. 34, 38).

Description. Only females are known. Total length 2.3 to 2.5 mm, carapace length 0.7 to 0.8 mm, sternum length 0.5 mm. Clypeus height half AME diameter. Coloration (Fig. 40) similar to that of *A. albicans*. A thin, broad anterior rim on the genital area's ventral surface borders a broad, shallow atrium (Fig. 43). In posterior view (Fig. 44) genital area's ventral surface concave, its dorsal surface convex, and its median dorsal margin with two dorsal lobes separated by a shallow depression. An opening located lateral to the base of each lobe connects to a short bursa giving rise to two straight ducts, each leading to an apparently blind spermatheca (Fig. 45). A large accessory gland lies ventral to each lateral spermatheca and opens externally via a separate duct.

Distribution. Known only from the type locality in Panama.

Polenecia Lehtinen
Figures 46–54, Map 1

Sybota [part]:—Simon, 1892, Histoire Naturelle des Araignées, 1(1): 1–256. Paris.

Polenecia Lehtinen, 1967, Ann. Zool. Fennici, 4: 199–468. Type species by original designation and monotypy *Uloborus productus* Simon, 1873, Mém. Soc. roy. sci. Liège, 2(5): 1–174. Seven mature and one immature female syntypes (No. AR-150) from Corsica, in Muséum National d'Histoire Naturelle, Paris, examined. The genus name is feminine.

Diagnosis. Polenecia and *Sybota* females are the only uloborids to have an abdomen with a prominent posterior projection (Figs. 51, 102, 114, 116). *Polenecia* males and females lack PLE tubercles (Fig. 50) like those found in male and female *Sybota* (Figs. 100, 103, 115) and are distinguished by being the only uloborids to have a procurved anterior eye row (Fig. 50). Males are characterized by a palpus (Figs. 46, 47) with: 1. a thin cymbial projection and two short, marginal cymbial macrosetae, 2. a broad conductor with a long, thin medial projection which, along with a thin proximal median apophysis extension, serves as an embolus guide, and 3. a lateral endite lobe which bears stridulatory ridges. *Polenecia* females, unlike *Sybota* females, have a posteriorly directed, midventral genital extension (Fig. 52).

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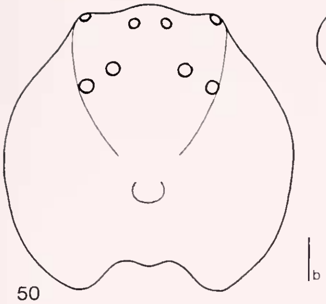
Figures 50–54. *Polenecia producta* (Simon). 50. Female carapace. 51. Lateral view of female abdomen. 52. Ventral view of female genitalia. 53. Posterior view of female genitalia. 54. Dorsal view of cleared female genitalia. Figures 55–61. *Hyptiotes cavatus* (Hentz). 55. Female carapace. 56. Lateral view of female abdomen. 57. Dorsal view of female, right, first femur. 58. Retrolateral view of female left first patella showing position of lyriform organs. 59. Ventral view of epigynum. 60. Posterior view of epigynum. 61. Dorsal view of cleared epigynum. Figure 62. *Hyptiotes paradoxus* C. Koch, dorsal view of cleared epigynum.



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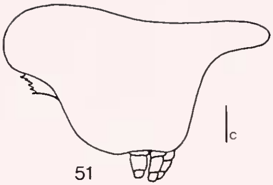

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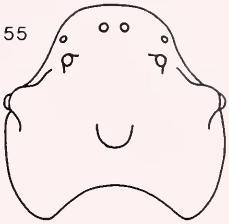

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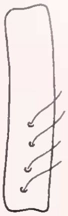

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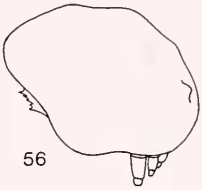

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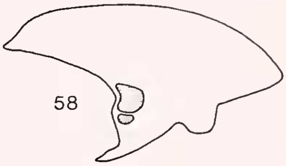

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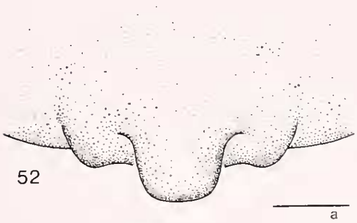

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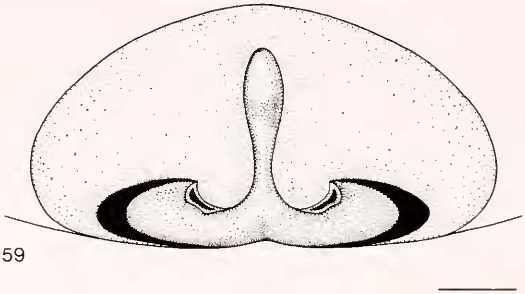

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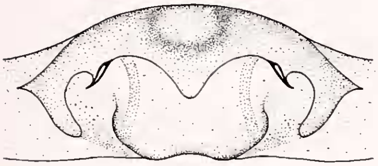

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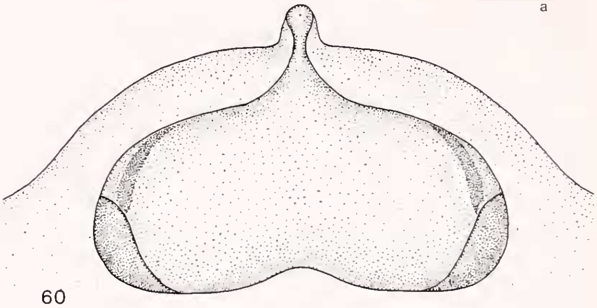

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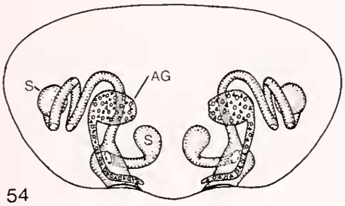

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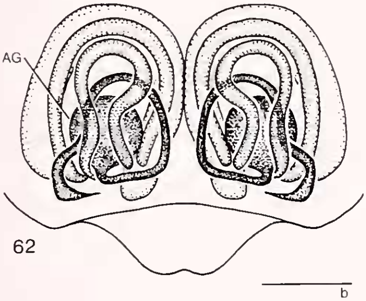

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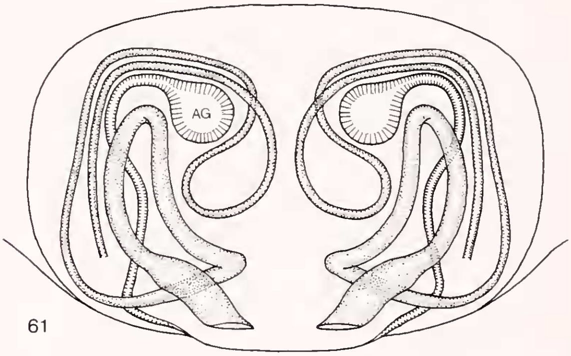

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Description of Type Species. Female total length 3.8 mm, carapace length 1.2 mm, sternum length 0.9 mm. Male total length 2.6 mm, carapace length 1.0 mm, sternum length 0.8 mm. Carapace width and length equal. Cephalic region rises from shallow thoracic depression and at level of ALEs has a width half maximum carapace width. Although raised medially, cephalic region has no conspicuous eye tubercles (Fig. 50). Thoracic region slopes abruptly to petiole. Anterior eye row procurved. Posterior eye row recurved such that a line across posterior margins of PMEs passes along anterior margins of PLEs. In dorsal view anterior extension of the clypeus equal to one AME diameter and in anterior view height one to one-and-one-third AME diameter. Median ocular area's anterior width half and its length two-thirds its posterior length. Female sternum width half and male sternum width 0.6 its length. Prolateral surface of the female palpal femur concave. Female first femur 1.5 and male first femur 1.6 times carapace length. Female calamistrum 0.63 length of metatarsus IV. Male with weakly developed calamistrum two-thirds the length of metatarsus IV. First male femur with two dorsal, four prolateral, and three retrolateral macrosetae (Fig. 49). First male tibia with two separate and four clustered ventral, one dorsal, two prolateral, and two retrolateral macrosetae. Width and height of female abdomen two-thirds length. Prominent median tubercle arises from posterior third of female abdomen and extends posterodorsally for distance equal to one-fourth to one-third the abdomen's length (Fig. 51). Male abdomen cylindrical, compressed dorsoventrally and laterally constricted near center in a manner reminiscent of some casterine clubionids. A dorsomedian mound in the posterior third of male's abdomen bears a tuft of heavy setae. Male and female abdomen white with dense covering of light setae and darkly pigmented around base of spinnerets and booklung area. One male has a dark median, dorsal stripe. Male and female carapace tan with white guanine deposits near thoracic depression and lateral margins of thoracic region. Sternum has gray margins and brown central region. Legs without conspicuous markings. Two stout tracheal trunks extend inot cephalothorax.

Male Palpus. Femur without ventral tubercles and tarsus without middle hematodocha. Median apophysis' distal lobe a flat plate and its proximal lobe a long, flat spur which lies distal to the embolus and conforms to its curvature (Figs. 46, 47). Radix appears as a small lateral plate near embolus base. A broad, flat conductor located at the proximal, median surface of the tarsus has two lobes: a small lateral one and a long, thin, trough-shaped median lobe which, along with the median apophysis' proximal spur, serves as a guide for the embolus.

Female Genitalia. Genitalia a ventral mound with posteromedian lobe one-third the width of raised genital area (Fig. 52). In posterior view (Fig. 53) genital area's broad, weakly sclerotized dorsomedian region bordered ventrally and laterally by well sclerotized M-shaped edge of raised ventral region. An opening is found at each ventrolateral margin of weakly sclerotized median region and leads to a broad bursa giving rise to a small, blind median bulb and a long, coiled, anterior duct leading to a small, spherical, lateral spermatheca (Fig. 54). Fertilization ducts may lead from these anterolateral spermathecae, but none is visible. Dorsal to spermathecal ducts is a pair of large, apparently solid accessory glands whose ducts pass posteriorly, but do not connect with the bursae. These ducts probably have separate external openings as do those of *Waitkera waitkerensis*.

Natural History and Distribution. The only described species, *Polenecia producta*, constructs a circular or semicircular vertical web which lacks capture spirals and has cribellate silk on the radii and framework threads (Wiehle, 1931). Eggsacs are attached to the twig which forms a central, vertical support for the web. This species is known from Corsica, Spain, Portugal, Algeria, Tunisia, and Syria (Map 1).

Hyptiotes Walckenaer

Figures 55–64, Plate 4-A–D; Map 1

Mithras [preoccupied] C. L. Koch, 1834, Arachniden. *in* Panzer, Faunae Insectorum Germaniae initia, 123: 9. Type species by monotypy *Mithras paradoxus* C. L. Koch, 1834, *ibid.*, disposition of types unknown. Preoccupied by *Mithras* Huebner, 1818, Verz. bekannt. Schmett., 5: 79—Lepidoptera.

Uptiotes Walckenaer, 1837, Histoire naturelle des Insectes, Aptères, 1: 277–279. Type species by monotypy *Uptiotes anceps* Walckenaer, 1837, *ibid.* [= *M. paradoxus* C. L. Koch]. Disposition of type specimens unknown.

Hyptiotes (emendation of *Uptiotes* Walckenaer, 1837, *op. cit.*): Erickson, 1845, Nomina systematica Generum Arachnidarum, p. 14. *in* Agassiz, 1846, Nomen. Zool. Index Univ. pp. 1–14.

Cyllopodia Hentz, 1847, Boston J. Nat. Hist., 5: 466. Type species by monotypy *Cyllopodia cavatus* Hentz, 1847. Female holotype from Alabama, collected in October by Hentz, specimen lost.

Note. The senior synonym *Uptiotes* has not been used in primary literature since 1845 and the emended name *Hyptiotes* has gained universal acceptance. Application is being made to The International Commission on Zoological Nomenclature for suppression of the name *Uptiotes* as an unused senior synonym provisions of amended Article 79 of the International Code of Zoological Nomenclature.

Diagnosis. Hyptiotes males and females are distinguished from those of all other genera by having: 1. anterior half of carapace abruptly narrowed to half the width of the posterior half (Fig. 55), 2. straight anterior eye row whose AMEs are three to four diameters from carapace's anterior rim, 3. median ocular area whose anterior width is one-fourth its posterior width, 4. carapace whose posterior half is flat or depressed and in lateral view slopes from petiole to PLEs, and 5. length of female first femur less than carapace length and male first femur equal to carapace length.

Description. Total length of females 2.3 to 5.0 mm, of males 2.0 to 3.0 mm. Carapace width equal to or slightly greater than length. Abdomen extends anteriorly over carapace, nearly reaching level of posterior eye row in many species. Posterior two-thirds of carapace flat or medially depressed and sloping upward from petiole to posterior eye row. The PLEs on conspicuous lateral tubercles and ALEs small and in some specimens difficult to see (Fig. 55). Anterior eye row straight and posterior eye row recurved such that a line along posterior margins of PMEs passes anterior to PLEs by a distance equal to three-fourths to one PLE diameter. Median ocular area's anterior width one-fourth and its length one-third its posterior width. In dorsal view clypeus extends anteriorly a distance equal to four to five AME diameters. Sternum width 0.5 to 0.6 its length. Female palpal femur flattened. Female first femur 0.7 to 0.9 carapace length. Male first femur 0.9 to 1.1 carapace length. Female calamistrum nine-tenths length of metatarsus IV. Males have a weak calamistrum four-fifths the length of metatarsus IV. Male first femur with two prolateral, three to seven retrolateral, and three to four dorsal macrosetae (Fig. 63). Male first tibia with eight to twelve prolateral, two to fifteen retrolateral, three to four dorsal, and zero to seven ventral macrosetae. Numerous stout setae are also present on tibia I of most males. Female abdomen two-thirds as wide and two-fifth to three-fourths as high as long (Fig. 56). Abdomen of many species with four pairs of small, lateral tubercles each bearing a tuft of flat setae. Male abdomen usually more slender and often lacking tubercles. Two stout tracheal trunks extend into cephalothorax.

Male Palpus. Femur lacks proximal, ventral tubercles and tarsus has no middle hematodocha. Median apophysis spur of American species forms a long, thin, curved extension with a broad, flattened tip (Plate 4-A–D). In Old World species median apophysis is a short, broad projection. Proximal portion of median apophysis flattened, expanded, and covering most of tarsus' proximal lateral surface. This flattened terminus lies in a groove of the large, flat conductor and with this sclerite serves as a guide for a long, thin embolus which makes one-and-one-half loops before terminating near median apophysis spur (Fig. 64). Between the grooved conductor terminus and median apophysis spur's base is a small, projecting sclerite that appears to be a conductor branch.

Epigynum. Epigynum's posterior face formed by a broad, sclerotized plate with a narrow ventromedian extension continuing onto the epigynum's ventral surface where it lies on a raised median ridge and terminates in a prominent tubercle (Figs. 59, 60). Epigynal openings lateral to this extension's base, each leading via a broad bursa to a long, coiled duct that presumably connects to the vagina (Figs. 61, 62). Among the coils of each duct is a thick-walled accessory gland (mistaken by Muma and Gertsch, 1964, for a spermatheca) whose long, thin duct appears to open at the epigynum's posterior margin independently of the epigynal openings. In Old World species (Fig. 62) the bursae are longer and the accessory glands larger and more posteriorly situated than in American species (Fig. 61).

Natural History and Distribution. Members of this genus construct a vertical, sectoral web consisting of four "radii," as discussed more fully under Natural History. This genus is represented in North America, Europe, Japan, and, according to Muma and Gertsch (1964), India and Ceylon (Map 1).

Siratoba new genus
Figures 65–77, Plate 3-C, D; Map 1

Type. The type species of *Siratoba* is *Ariston referens* Muma and Gertsch, 1964, Amer. Mus. Novitates, 2196: 17. The genus name is an arbitrary combination of letters and is feminine.

Diagnosis. Siratoba and *Ariston* are the only American genera whose female members have posterior genital hoods. Female *Siratoba* have a total length of 3.0 mm or more and have a prominent posterior plate in a genital atrium formed by the ventral hood (Figs. 66, 76); whereas, members of *Ariston* have a total length of less than 2.6 mm and lack such a plate (Figs. 33, 37, 44). *Siratoba* has been collected only from the southwestern United States and northern and central Mexico. *Ariston's* range extends from southern Mexico through Central America. *Siratoba* females are distinguished by having: 1. PMEs separated by a distance no more than one-and-one-half times that separating AMEs (Fig. 72), 2. PME separation one-and-one-half times that of the PME-PLE separation, 3. PME and PLE mounds separate in anterior view, and 4. abdomen with a middle peak (Figs. 71, 74). The only known males belong to *S. referena* and are distinguished by having a total length of about 2.7 mm and a conspicuous, coiled radix with a central groove in which the embolus lies (Figs. 68, 69; Plate 3-C, D).

Description. Carapace width 0.80 length. Cephalic region rises slightly from shallow thoracic depression and at level of ALE is about 0.70 carapace width. Both eye rows about equally recurved such that a line across posterior

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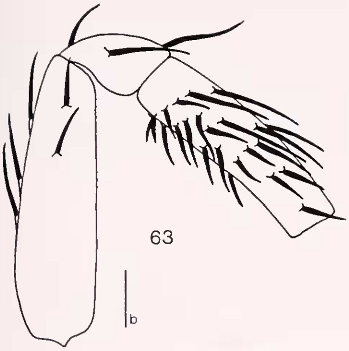
Figures 63–64. *Hyptiotes cavatus* (Hentz). 63. Prolateral view of male, left, first femur, patella, and tibia. 64. Retrolateral view of embolus (black), sperm reservoir, and fundus. Figures 65–74. *Siratoba referena* (Muma and Gertsch). 65. Ventral view of epigynum. 66. Posterior view of epigynum. 67. Dorsal view of cleared epigynum. 68. Apical view of left male palpus. 69. Retrolateral view of left male palpus. 70. Prolateral view of male, left, first femur, patella, and tibia. 71. Dorsal view of female. 72. Female carapace. 73. Dorsal view of female right first femur. 74. Lateral view of female abdomen.



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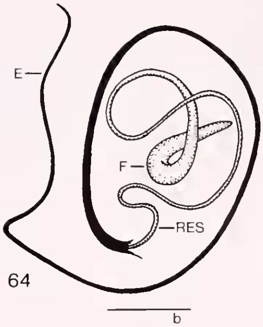

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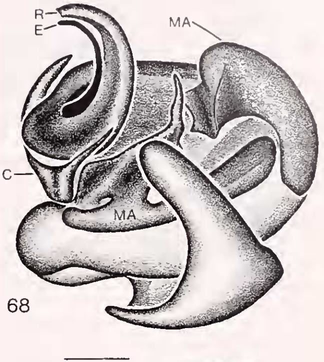

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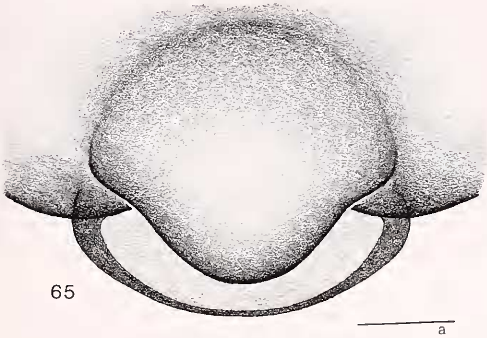

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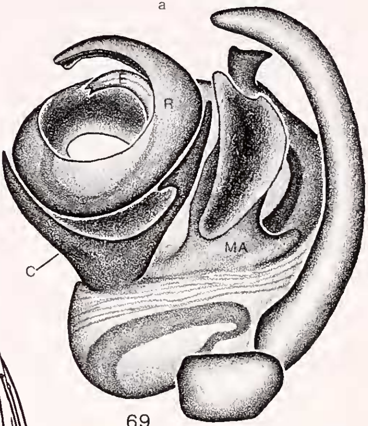

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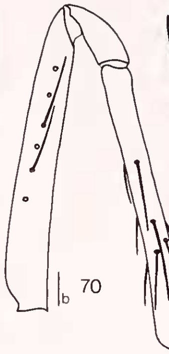

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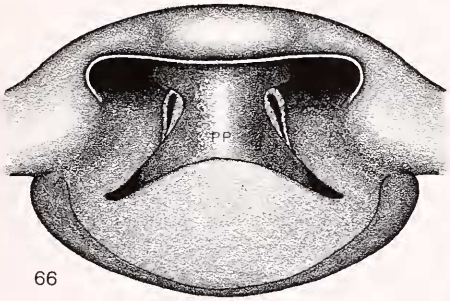

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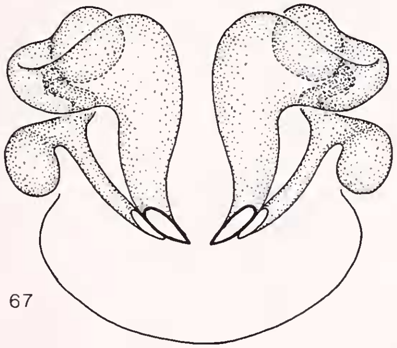

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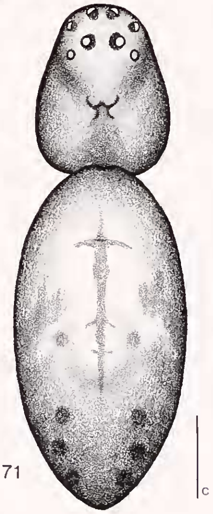

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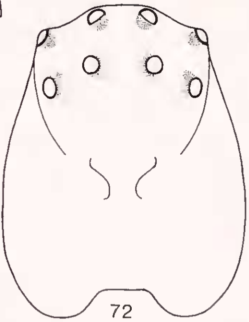

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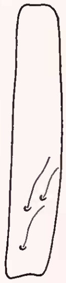

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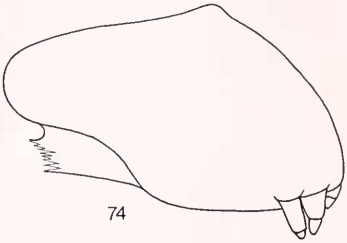

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margins of median eyes passes along anterior border of lateral eyes (Fig. 72). Median ocular area about four-fifths as wide anteriorly as posteriorly and its length equal to its anterior width. In anterior view clypeus height of females four-fifths to one AME diameter and in males one-and-one-half AME diameter. Sternum width 0.68 its length. Female palpal femur laterally flattened. Femur I about 1.5 times carapace length. Female calamistrum half the length of metatarsus IV. Femur I of males has six prolateral, three retrolateral, and one proximal dorsal macroseta (Fig. 70). Tibia I has three prolateral, retrolateral, dorsal and ventral macrosetae. Abdomen of male and female has a median central peak and its width and height are each half its length (Figs. 71, 74). Two stout tracheal trunks extend into cephalothorax.

Male Palpus. Palpal femur bears a proximal retrolateral lobe. Large, helical radix with concave inner surface forming a groove in which embolus lies (Figs. 68, 69; Plate 3-C, D). U-shaped conductor lies along the radix's proximal surface and its median lobe, along with part of the radix, appears to rest in the trough-shaped proximal median apophysis lobe. The proximal lobe terminus in turn appears to rest in the grooved tip of the flat distal median apophysis lobe.

Epigynum. A prominent, ventral hood (Figs. 65, 75) extends posteriorly over a dorsal atrium containing a median posterior plate (Figs. 66, 76). An epigynal opening is found at each ventrolateral corner of this plate (Figs. 66, 76). A large, thin-walled bursa leads from each opening and connects to an oval, anterior spermatheca (Figs. 67, 77). Posterolateral to the spermatheca is a smaller, spherical accessory gland which appears to connect both to the spermatheca's posterior surface and to the exterior near the epigynal opening. Connection between accessory glands and spermathecae is difficult to establish with certainty owing to the small size of specimens.

Distribution. This genus is represented only in the southwestern United States and northern and central Mexico (Map 1). Nothing is known of its natural history.

KEY TO *SIRATOBA* FEMALES

(Males of only *S. referena* are known)

1. Epigynal hood two-thirds as wide as the epigynum (Fig. 65); in ventral view the epigynum's posterior margin curved posteriorly, southwestern United States and northern Mexico .... *referena*
– Epigynal hood one-third as wide as the epigynum (Fig. 75); in ventral view the epigynum's posterior margin curved anteriorly, central Mexico .... *sira*

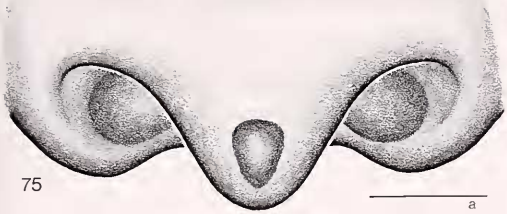
Siratoba referena (Muma and Gertsch) new combination
Figures 65–74, Plate 3-C, D

Ariston referens Muma and Gertsch, 1964, Amer. Mus. Novitates, 2196: 17. Male holotype from Cochise Stronghold, Dragoon Mountains, Arizona, collected 7 September 1950 by W. J. Gertsch, female allotype from Douglas, Arizona, collected 27 August 1939 by R. H. Crandell, both in the American Museum of Natural History, examined.

Diagnosis. The only known males of *Siratoba* belong to this species. Females are distinguished from those of *S. sira* by having an epigynal hood which is two-thirds (Fig. 65) rather than one-third (Fig. 75) the epigynal width and a posterior epigynal margin which, in ventral view, is curved posteriorly rather than anteriorly.

→

Figures 75–77. *Siratoba sira* n. sp. 75. Ventral view of epigynum. 76. Posterior view of epigynum. 77. Dorsal view of cleared epigynum. Figures 78–85. *Miagrammopes simus.* 78. Dorsal view of female. 79. Lateral view of female cephalothorax. 80. Dorsal view of male. 81. Female sternum, endites, and labium. 82. Male sternum, endites, and labium. 83. Ventral view of epigynum. 84. Retrolateral view of female first left patella. 85. Retrolateral view of embolus (black), sperm reservoir, and fundus. Figures 86–93. *Miagrammopes latens* Bryant. 86. Dorsal view of female. 87. Dorsal view of male. 88. Ventral view of epigynum. 89. Dorsal view of cleared epigynum. 90. Retrolateral view of left male palpus. 91. Prolateral view of left male palpus. 92. Female sternum, endites, and labium. 93. Male sternum, endites, and labium.



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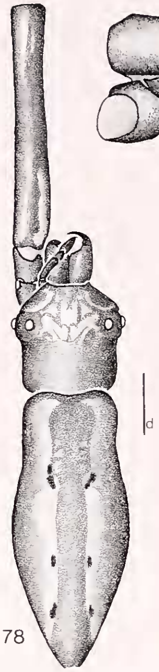

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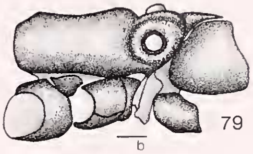

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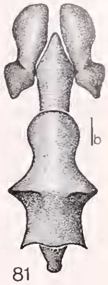

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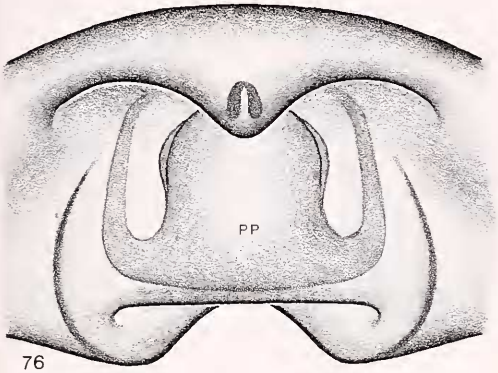

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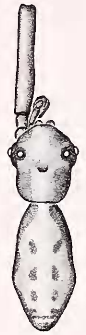

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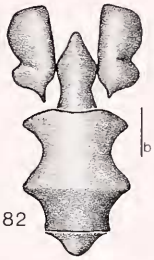

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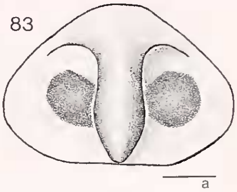

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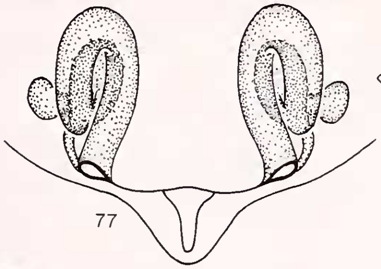

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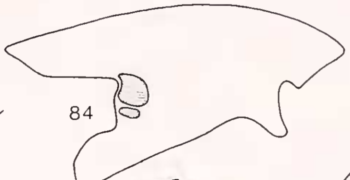

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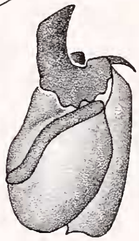

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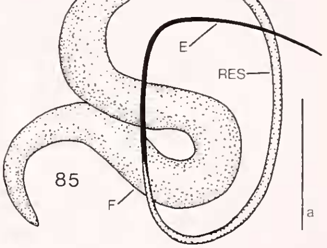

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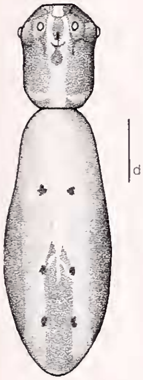

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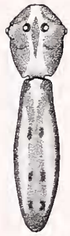

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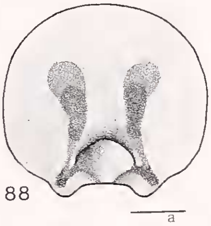

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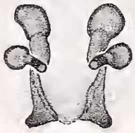

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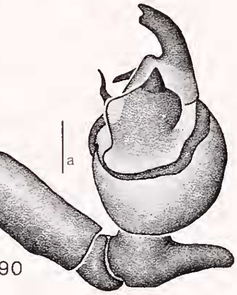

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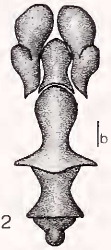

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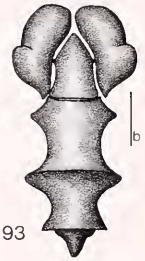

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Description. Male. Total length 2.7 mm, carapace length 0.9 mm, sternum length 0.7 mm. Carapace and legs tan, sternum gray. Dorsum of abdomen white, venter gray. Features of the male palpus are given in genus description.

Female. Total length 3.2 mm, carapace length 1.1 mm, sternum length 0.7 mm. Carapace and legs tan, sternum dark gray. Abdomen's dorsum white with three pairs of posterior and one pair of central gray spots (Fig. 71). Venter dark gray with narrow longitudinal stripe extending half the distance from epigastric furrow to cribellum. When viewed ventrally (Fig. 65), epigynum has a posteriorly directed hood two-thirds the epigynum's width and a posterior margin which curves posteriorly. In posterior view (Fig. 66) epigynum's dorsal surface convex and posterior plate dorsally concave, narrowing as it passes into hollow formed by hood. Epigynal openings at lateral margins of the posterior plate, each leading to a large, thin-walled, bulbous bursa which connects to a nearly spherical spermatheca. A lateral, spherical accessory bulb opens lateral to each epigynal opening and appears also to connect via a convoluted duct to the spermatheca (Fig. 67).

Distribution. Southwestern United States and northern Meixco.

Siratoba sira n. sp.
Figures 75–77

Types. Female holotype from entrance of cave at Taninul in the Mexican state of San Luis Potosí, collected 29 March 1940 by W. Bridges, in the American Museum of Natural History. The specific epithet is derived from the Greek term for cellar.

Diagnosis. Males of this species are unknown. Females are distinguished from those *S. referena* by having an epigynal hood which is one-third (Fig. 75) rather than two-thirds (Fig. 65) the epigynum's width and a posterior epigynal margin which, when viewed ventrally, is curved anteriorly rather than posteriorly.

Description. Female. Total length 2.9 mm, carapace length 0.9 mm, sternum length 0.6 mm. Carapace and legs light tan, sternum light gray with dark border. Dorsum of abdomen white, venter white with wide gray paraxial stripes. In ventral view (Fig. 75) epigynum's posteriorly directed hood one-third its width and epigynum's posterior margin curved anteriorly. Hood with dorsal pit near its tip (Figs. 75, 76). In posterior view (Fig. 76) epigynum's posterior margin concave and posterior plate's dorsal margin nearly straight. Sides of posterior plate nearly parallel and epigynal openings located along their borders. Each opening leads via a wide, thin-walled bursa to an oval spermatheca. A small accessory gland appears to connect to each spermatheca's lateral margin by a short duct and to open externally near the epigynal opening (Fig. 77).

Distribution. Central Mexico.

Miagrammopes O. Pickard-Cambridge
Figures 78–97, Plate 5; Map 1

Miagrammopes O. Pickard-Cambridge, 1869, J. Linn. Soc. London (Zool.), 10: 400. Type species by virtue of first listing in publication *M. thwaitesii* O. Pickard-Cambridge, 1869, *ibid.*

Note. Octavius Pickard-Cambridge (1870) established the family Miagrammopidae for the genus *Miagrammopes*, but Thorell (1873) considered Miagrammopinae as a uloborid subfamily. Lehtinen (1967) divides *Miagrammopes* (Miagrammopinae) into the following genera: 1. *Miagrammopes* O. Pickard-Cambridge, 1869, *op. cit.* Type species *M. thwaitesii* O. Pickard-Cambridge, 1869, *op. cit.* 2. *Ranguma* Lehtinen, 1967, Ann. Zool. Fennici, 4: 199–468. Type species by original designation *M. similis* Kulczynski, 1908, Ann. Mus. Nat. Hungary, 6: 484. 3. *Huanacauria* Lehtinen, 1967, *op. cit.* Type species by original designation *M. bambusicola* Simon, 1893, Ann. Soc. ent. France, 61: 421–462. 4. *Mumaia* Lehtinen, 1967, *op. cit.* Type

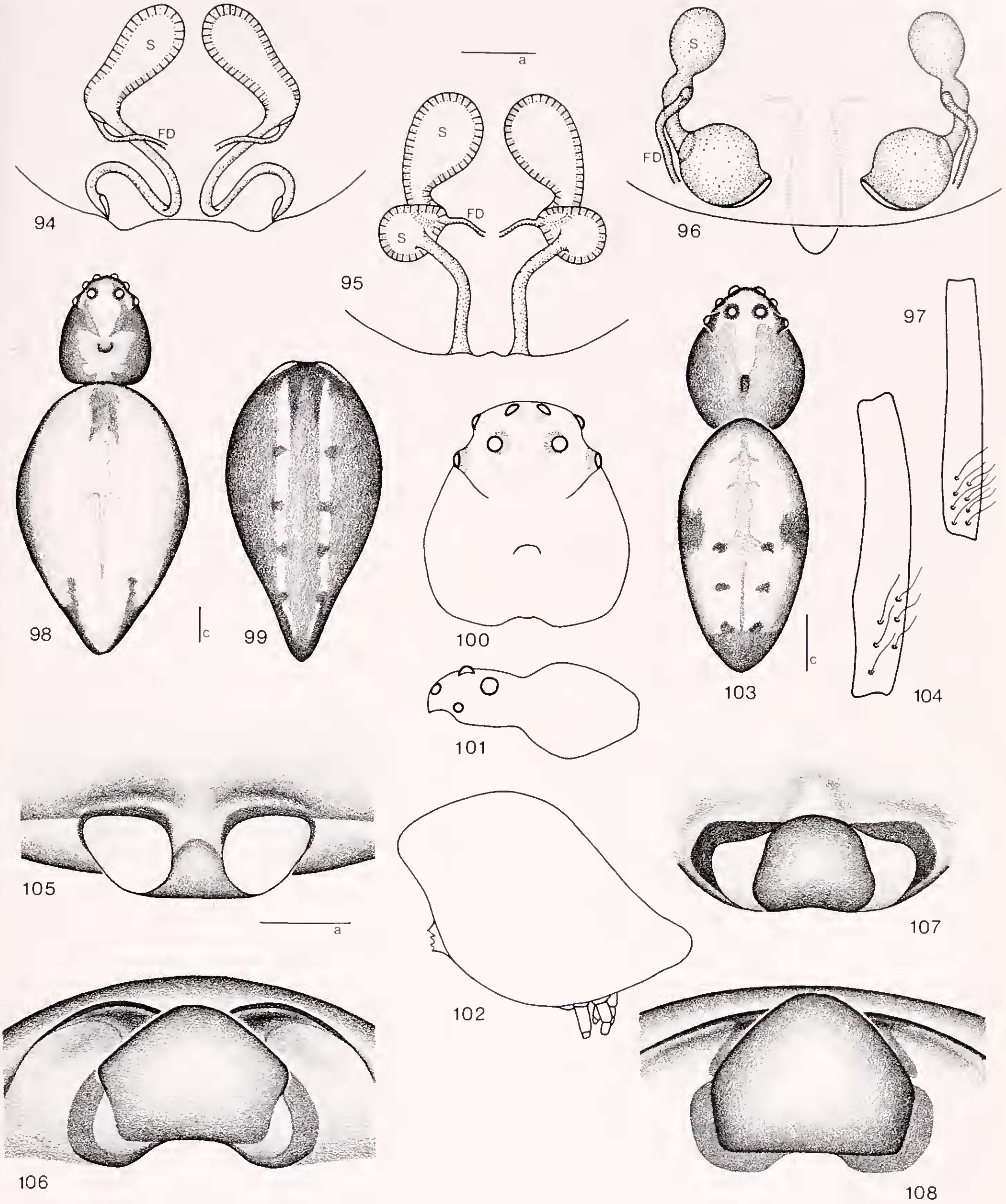

Figure 94. *Miagrammopes corticinus* Simon, dorsal view of cleared epigynum. Figure 95. *Miagrammopes bambusicola* Simon, dorsal view of cleared epigynum. Figures 96–97. *Miagrammopes simus*. 96. Dorsal view of cleared epigynum. 97. Dorsal view of female first right femur. Figures 98–108. *Sybota abdominalis* Nicolet. 98. Dorsal view of female. 99. Dorsal view of female abdomen. 100. Female carapace. 101. Lateral view of female carapace. 102. Lateral view of female abdomen. 103. Dorsal view of male. 104. Dorsal view of female first right femur. 105. Ventral view of epigynum. 106. Posterior view of epigynum. 107. Ventral view of epigynum. 108. Posterior view of epigynum.

species by original designation *Miagrammopes corticeus* Simon, 1892, *op. cit.*

I have examined type specimens of *Miagrammopes corticeus*, *M. similis*, and *M. bambusicola* as well as Neotropical, Australian and Oriental specimens of this group and believe it to represent a monophyletic assemblage. This is not to say that Lehtinen's division of this assemblage is unwarranted. I have not undertaken a comprehensive study of the miagrammopoid uloborids and for this reason will attempt neither to characterize nor synonymize Lehtinen's genera. Rather, I will deal with this assemblage as the traditional or broader genus *Miagrammopes sensu lato*. My phylogenetic conclusions, however, lead me to reject the subfamily ranking given to the group.

Diagnosis. Males and females of this genus are distinguished from all other uloborid genera by lacking anterior eyes (Figs. 78, 80, 86, 87), and by having a labium and endites which are two times as long as wide (Figs. 81, 82, 92, 93). The sternum of many species is very narrow and divided into two or three plates by flexible transverse areas (Figs. 81, 92, 93).

Description. Total length of males 2.8 to 3.5 mm, carapace length 1.0 to 1.2 mm, sternum length 0.5 to 0.6 mm. Total length of females 4.0 to 6.2 mm, carapace length 1.2 to 2.2 mm, sternum length 1.0 to 1.4 mm. Carapace width of both males and females three-fourths to slightly more than one times carapace length. In lateral view (Fig. 79) carapace nearly flat with first coxa extending from anterior surface. Anterior eyes absent. Posterior median eyes separated from carapace's anterior rim by a distance equal to 0.25 to 0.36 the carapace length (Figs. 78, 80). Posterior eye row either: 1. procurved such that a line across that anterior border of the median eyes passes through the lateral eyes or along their posterior margin, 2. straight, or 3. recurved such that a line across the median eyes' posterior margins passes anterior to the lateral eyes by as much as one PLE diameter. The PME and PLE nearly equal in size. The PLEs on distinct lateral tubercles. The PMEs may be from two to 20 times further from one another than from the PLEs (Figs. 78, 86). In addition to a shallow thoracic pit, a conspicuous depression is located medially or posteromedially to each PME. Sternum with conspicuous intercoxal projections and in many species divided by thin, flexible, transverse regions into 3 plates: one extending between the first two pairs of coxae, a second between the third coxae, and a third between the fourth coxae. Femur 1 1.9 to 2.5 times as long as carapace in females and 1.5 to 1.7 times in males. Metatarsae I and IV laterally flattened and in females the latter has a row of stout spines extending along most of its ventral surface and a dorsal calamistrum which is 0.6 to 0.7 its length. Femur I of males lacks spines, but dorsal surface of tibia I has spines along its entire length. Abdomen of males and females cylindrical to spindle-shaped, width 0.25 to 0.40 length, usually attaining its maximum width and height near its center. Transverse, common spiracular groove noticeably forward of cribellum, situated one-eighth to one-sixth distance from cribellum to epigastric furrow. Two stout tracheal trunks extend into cephalothorax.

Male Palpus. Femur lacks ventral, lateral tubercles. Long, narrow lobe on patella's dorsal surface extends above the tarsal base (Plate 5-A, B; Fig. 90). Hematodocha absent. Median apophysis bulb and median apophysis spur modified in both shape and orientation (Plate 5). Conductor's proximal lobe serves as an embolus guide, but its distal spur may be simple (Plate 5-A) or modified (Plate 5-B–D).

Epigynum. Epigynum flat with openings at posterior. Each opening leads to a blind, anterolateral spermatheca whose posterior margin gives rise to either a fertilization duct (Fig. 94) or a lateral bulb from which a fertilization duct arises

(Figs. 89, 95). In *M. simus* (Fig. 96) each epigynal opening leads first to a large, oval bursa and then to a blind spermatheca.

Natural History and Distribution. Members of this genus are known to produce either a single horizontal capture thread with cribellar silk along its center or a horizontal resting thread to which one or several vertical or diagonal cribellar capture threads are attached (Akerman, 1932; Lubin *et al.*, 1978). The genus has a cosmotropical distribution.

Sybota Simon
Figures 98–119, Plate 6-A, B; Map 1

Sylvia [preoccupied] Nicolet, 1849, Aráchnidos. *in* Gay, Historia físca y política de Chile. Zoologia 3: 465. Type species *Sylvia abdominalis* Nicolet, subsequent designation by Simon, 1892, Histoire Naturelle des Araignées, 1(1): 216, Paris. Preoccupied by *Sylvia* Scopoli 1769, Annus 1: 154.—Aves.

Sybota Simon, 1892, *op. cit.* New name (Feminine) for homonym.

Diagnosis. *Sybota* and *Polenecia* females are the only uloborids to have a posterior abdominal projection extending beyond the spinnerets (Figs. 102, 110, 116). *Sybota* females and males have prominent PLE tubercles (Figs. 100, 103, 115); whereas those of *Polenecia* do not (Fig. 50). The anterior eye row of *Sybota* males and females is recurved rather than procurved as in *Polenecia. Sybota* males are characterized by having: 1. no hematodocha (Plate 6-A, B), 2. a well-developed conductor, and 3. a two- or three-pronged median apophysis. The posterior plate of *Sybota* females has a ventrally directed median extension on either side of which is a weakly sclerotized area (Figs. 105–108).

Description. Carapace width 0.7 to 1.0 its length. Female cephalic and thoracic regions each rise slightly from a shallow thoracic depression and attain about equal height (Fig. 101). Thoracic region slopes steeply to petiole. Male carapace nearly flat, rising slightly in ocular area and sloping gradually from thoracic pit to petiole. At ALEs cephalic region of males and females is half as wide as carapace (Figs. 101, 103). Ocular area raised and conspicuously set off from remainder of carapace (Figs. 100, 115). The PLEs on broad, prominent, laterally directed tubercles. In *S. mendoza* AMEs on an anterior tubercle (Fig. 115). Both anterior and posterior eye rows are recurved, posterior row such that a line across the posterior margins of PMEs passes along the anterior margins of PLEs (Figs. 100, 115). In anterior view female clypeus equal in height to AME diameter and male clypeus 1.4 times AME diameter. Male ALEs smaller than AMEs. Median ocular area one-and-one-half to two times as wide posteriorly as anteriorly and about two-thirds as long as its maximum width. Sternum width 0.6 to 0.7 its length. Female femur I 1.3 to 1.5 times as long as carapace; male femur I 1.5 to 1.7 times as long. Calamistrum half the length of metatarsus IV. Female palpal femur laterally compressed. Femur I of males with three or four dorsal, five or six prolateral, and three retrolateral spines. Tibia I with four or five ventral, two or three dorsal, seven proximal, and two retrolateral spines. Female abdomen half to three-fifths as wide and high as long and posteriorly narrowed into a conical projection which extends beyond spinnerets for a distance equal to one-fifth to one-third the abdomen's length (Figs. 98, 102, 110, 114, 116). Male's abdomen oval, about half as wide as long, dorsally flattened, and extended about one-sixth its length beyond spinnerets (Fig. 103). Four stout tracheal trunks extend into the cephalothorax.

Male Palpus. Femur without ventral tubercles and tibia with a distal lobe which extends beyond tarsal base. Long dorsal spine present on patella and tibia. Cymbium with two long spines on its distal median edge. Middle hematodocha absent and palpal sclerites situated quite distally (Plate 6-A, B). Median apophysis terminal, flattened, and with three distally directed processes. Embolus curved around median apophysis' base, coming to lie in the groove of conductor's basal lobe.

Epigynum. Epigynum's posteromedian margin formed by posterior plate (Figs. 106, 113, 118) and, depending on the shape of this plate, either rounded (Fig. 112) or indented (Fig. 117) in ventral view. Lateral to this plate on epigynum's ventral surface is a pair of level or raised lighter areas, each with a low ridge at its anterior border (Figs. 105, 106). An epigynal opening is situated at each ventrolateral border of the posterior plate and leads via a short duct to an anterior bifurcation which connects with a blind spermatheca and a posterior bifurcation which gives rise to a fertilization duct (Figs. 109, 119).

Natural History and Distribution. The three known species in this genus appear restricted to central and southern Chile and the adjacent regions of Argentina (Map 1).

KEY TO *SYBOTA*

(Males of *Sybota mendozae* are not known.)

1. Males 4

– Females 2

2(1). Carapace width equal to length; AMEs not on conspicuous tubercle (Figs. 98, 100); posterior epigynal margin rounded slightly (Figs. 105, 112); posterior plate pentagonal or oval (Figs. 106, 113) 3

– Carapace width two-thirds length; AMEs on prominent anterior tubercle (Figs. 114, 115); posterior epigynal margin indented (Fig. 117); posterior plate diamond-shaped (Fig. 118) .... *mendozae*

3(2). Posterior plate of epigynum pentagonal, 1.5 times as broad as high and without a ventromedian depression (Figs. 105–108); carapace with white median line in cephalic region and red pigment just anterior to thoracic depression (Fig. 98) ...... *abdominalis*

– Posterior plate oval, twice as broad as high and with a slight ventromedian depression (Figs. 112, 113); carapace dark gray with no white or red markings .... *osornis*

4(1). Median apophysis of palpus with two prominent projections and a small central spur at the base of its broad lateral lobe (Plate 6-A); dorsum of abdomen predominantly white .... *abdominalis*

– Median apophysis with three conspicuous distal projections, the middle one clearly set off (Plate 6-B); dorsum of abdomen dark gray .... *osornis*

Sybota abdominalis (Nicolet)
Figures 98–109; Plate 6-A

Sylvia abdominalis Nicolet, 1849, Aráchnidos. *in* Gay, Historia físca y política de Chile. Zoologia 3: 465–468. Female neotype from Pucatrihue in the Chilean province of Osonoro, collected 12 April 1968 by L. Peña, in the Museum of Comparative Zoology.

Uloborus abdominalis:—Simon, 1887, Ann. Soc. ent. France, 7(6): 195.

Sybota abdominalis:—Simon, 1892, Histoire Naturelle des Araignées, 1(1): 1–256, Paris. New generic name for preoccupied *Sylvia*.

Note. Nicolet (1849) described five species (*Sylvia abdominalis, S. similis, S. ater, S. rubiginosa,* and *S. vittata*) as belonging to his new genus *Sylvia* [preoccupied]. After examining Nicolet's specimens, Simon (1892) concluded that they were varieties of the same species and selected *S. abdominalis* as the type species for the replacement genus name *Sybota.* As Lehtinen (1967) noted, the Nicolet types no longer exist or, if they do, cannot be located in the Muséum National d'Histoire Naturelle in Paris. It is probably for this reason that all authors prior to Lehtinen accepted Simon's inclusion of *S. abdominalis* and *S. (Uloborus) productus* (Simon) in *Sybota.* When Lehtinen created the genus *Polenecia* with *P. productus* as its type species, he necessarily changed the meaning of several studies dealing with uloborid webs, e.g., Kaston (1964 and 1966) and Wiehle (1931). Because these two genera play an important role in studies of uloborid phylogeny and evolution of web forms, it seems appropriate to designate a neotype for *S. abdominalis.* Additionally, description of two new *Sybota* species supports the need to clearly associate this species name with a type specimen. In the absence of a clear definition of *S. abdominalis* I have associated this name with the Chilean species which appears more commonly in collections, shows the more extensive altitudinal and geographical distribution, and has the greater color variation.

Diagnosis. Females of this species are distinguished from those of *S. mendozae* by having a carapace width equal to (Fig. 100) rather than two-thirds the carapace length (Fig. 115), by having only a slightly recurved anterior eye row, and by having an epigynum whose posterior margin is rounded (Figs. 105, 107) rather than indented (Fig. 117), whose posterior plate is pentagonal (Figs. 106, 108) rather than diamond-shaped (Fig. 118), and whose spermathecae are large and elongate (Fig. 109). *Sybota abdominalis* females differ from those of *S. osornis* by having a pentagonal posterior plate (Figs. 106, 108) without a conspicuous ventromedian depression and by having a carapace with a median white line (Fig. 98) and a red pigment spot just anterior to the thoracic depression.

Males of *S. abdominalis* differ from those of *S. osornis* by having a palpal median apophysis with two (Plate 6-A) rather than three (Plate 6-B) conspicuous distal projections and by having white rather (Fig. 103) than a dark gray abdominal dorsum.

Description. Males. Total length 3.6 to 4.0 mm, carapace length 1.3 to 1.4 mm, sternum length 0.8 to 0.9 mm. Carapace (Fig. 103) dark gray with tan lateral margins and a median white stripe extending from thoracic depression to ocular region where it expands. Sternum gray with a central tan area. Abdomen (Fig. 103) white with a dark gray posterior tip, three pairs of dorsal gray spots, and lateral transverse gray stripes. Median apophysis of palpus with a long, thin projection and a short, broad lobe with a small spur on its mesal base (Plate 6-A).

Females. Total length 5.1 to 5.9 mm, carapace length 1.4 to 1.6 mm, sternum length 0.9 to 1.1 mm. Carapace (Fig. 98) gray with a median white area extending to ocular region. This white area is expanded in the thoracic region of lighter specimens and largely restricted to the cephalic region of darker specimens. Red pigment spot just anterior to thoracic depression. Abdominal coloration variable, ranging from completely white to a gray venter and white dorsum (Fig. 98), with or without a median dorsal gray stripe; to a white venter and gray dorsum with dorsal paraxial white stripes (Fig. 99). It is tempting to place specimens with the latter coloration into a separate species, but little other evidence supports this. Legs lack conspicuous markings and vary in color from tan to gray. In ventral view (Figs. 105, 107) the epigynum's posterior margin is rounded and lateral to the posterior plate's convex ventral tip are two lightly sclerotized areas, bordered laterally by dark, subsurface ducts. In posterior view (Figs. 106, 108) the posterior plate is pentagonal and no more than 1.5 times as broad as high. Ducts are short and looped, leading to large, elongate spermathecae (Fig. 109).

Distribution. Collected from the Chilean provinces of *Osorno*: Puyehue—500 m, Pucatrihue—200 m; *Cautin*: N.E. Villarrica—300 to 600 m; *Llanquihue*: Chamiza—0 to 100 m; *Santiago*: El "Golf"; *Concepcion*: Bosque Ramuntcho—0 to 100 m.

Sybota osornis n. sp.
Figures 110–113; Plate 6-B

Types. Female holotype and two male paratypes from Purranque in the Chilean province of Osorno, collected January–March 1955 by E. Reed, in the American Museum of Natural History. The specific epithet is a third declension noun in the genitive case, derived from the province of the type locality.

Diagnosis. Females of this species are distinguished from those of *S. mendozae* by having a carapace width equal to rather than two-thirds the carapace length, by having only a slightly recurved anterior eye row, and by having an epigynum whose posterior margin is rounded

(Fig. 112) rather than indented (Fig. 117), whose posterior plate is oval (Fig. 113) rather than diamond-shaped (Fig. 118), and whose spermathecae are large and elongate (Fig. 109). *Sybota osornis* females differ from those of *S. abdominalis* by having a broad oval posterior plate with a conspicuous ventromedian depression (Figs. 112, 113) and by having a dark gray carapace with no color markings.

Males of *S. osornis* differ from those of *S. abdominalis* by having a palpal median apophysis with three (Plate 6-B) rather than two (Plate 6-A) conspicuous distal projections and by having a dark gray rather than a white abdominal dorsum.

Description. Male. Total length 3.8 to 4.1 mm, carapace length 1.5 to 1.6 mm, sternum length 1.0 mm. Carapace darkly mottled with gray except for light areas near the thoracic depression, in the ocular area, and at the carapace margins dorsal to coxae III and IV. Sternum dark gray with a narrow median light stripe. Legs dark brown to gray, with no conspicuous markings. Abdomen gray with small dorsal white spots and paraxial ventral stripes. Palpal median apophysis with three distinct distal projections (Plate 6-B).

Females. Total length 6.4 mm, carapace length 1.8 mm, sternum length 1.1 mm. Carapace and sternum dark gray, sternum with a small tan center region. Dorsum of abdomen dark gray with white anterior tip and two small, widely separated white spots in the anterior half. Venter with a median gray stripe and two paraxial light stripes. A lateral white stripe extends along each side of the abdomen. Legs dark with no conspicuous markings. In ventral view (Fig. 112) the epigynum's posterior margin rounded. Lateral to the posterior plate's concave ventral tip are two lightly sclerotized areas, bordered laterally by dark, subsurface ducts. In posterior view (Fig. 113) posterior plate oval and at least twice as broad as high. Ducts short and looped, leading to large, elongate spermathecae.

Distribution. Known only from the type locality.

Sybota mendozae n. sp.
Figures 114–119

Types. Female holotype and three female paratypes from 7 km W of Mendoza, Argentina, collected in "chaparral" at an altitude of 1200 m, March–April 1958 by B. Patterson. Holotype and two paratypes in the Museum of Comparative Zoology, one paratype in the American Museum of Natural History. The specific epithet is a first declension noun in the genitive case, derived from the type locality.

Diagnosis. Males are not known. Females are distinguished from those of *S. abdominalis* and *S. osornis* by having a carapace whose width is two-thirds its length (Figs. 114, 115), by having AMEs on a prominent tubercle, by having the anterior eye row more strongly recurved than the posterior, and by having an epigynum whose posterior margin is indented rather than rounded (Fig. 117), whose posterior plate is diamond-shaped (Fig. 118) rather than pentagonal or oval, and whose spermathecae are small and spherical rather than large and elongate (Fig. 119).

Description. Female. Total length 5.6 to 6.8 mm, carapace length 1.7 to 1.9 mm, sternum length 1.0 to 1.3 mm. Carapace brown to light gray, lighter along anterior midline and darker in ocular region (Fig. 114). Sternum dark gray with brown anterior median stripe. Dorsum of abdomen

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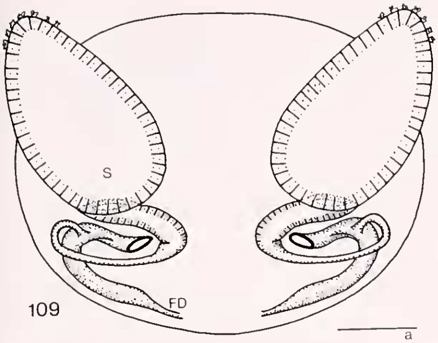
Figure 109. *Sybota abdominalis* Nicolet, dorsal view of cleared epigynum. Figures 110–113. *Sybota osornis* n. sp. 110. Lateral view of female abdomen. 111. Retrolateral view of male left embolus (black), sperm reservoir, and fundus. 112. Ventral view of epigynum. 113. Posterior view of epigynum. Figures 114–119. *Sybota mendozae* n. sp. 114. Dorsal view of female. 115. Female carapace. 116. Lateral view of female abdomen. 117. Ventral view of epigynum. 118. Posterior view of epigynum. 119. Dorsal view of cleared epigynum.



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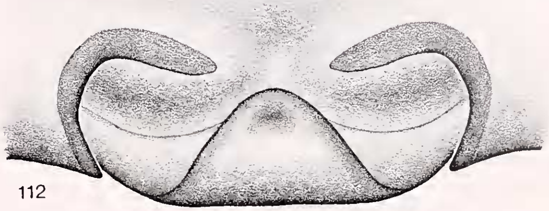

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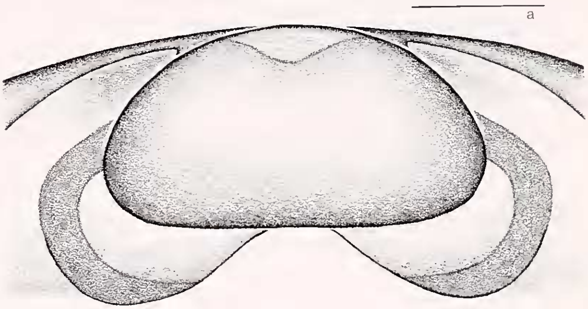

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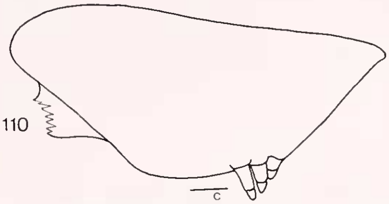

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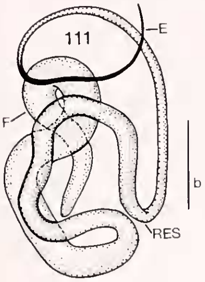

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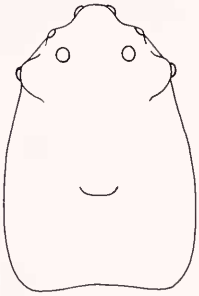

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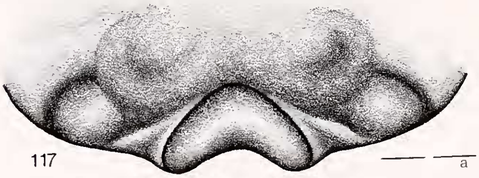

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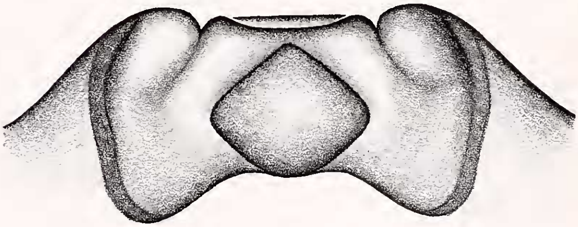

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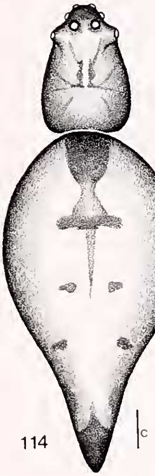

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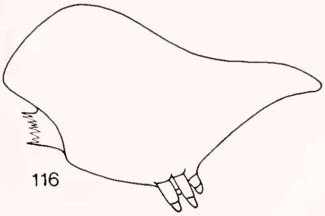

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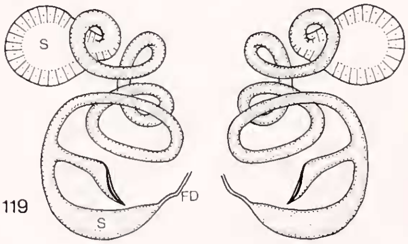

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all dark gray with slightly lighter paraxial areas or white with dark gray anterior median patch, gray transverse line in the anterior third of its length, three pairs of gray spots in the posterior half, and gray posterior tip (Fig. 114). Venter of abdomen with a median gray longitudinal stripe bordered by white patches or, in dark specimens, all gray. Abdomen's lateral surfaces all gray or white, mottled with dark gray spots. Legs brown with a dark gray longitudinal stripe on the dorsal surface of femur, patella, and tibia of leg I. Femora, tibiae, and metatarsi of legs II–IV each have a gray distal band. In ventral view (Fig. 117) epigynum's posterior margin indented with a pair of slightly raised lateral lobes lateral to the posterior plate's ventral tip. In posterior view (Fig. 118) posterior plate is pentagonal. Ducts are long and highly convoluted, leading to small, spherical spermathecae (Fig. 119).

Natural History and Distribution. This species is known only from the type locality in extreme western central Argentina. Darwin (1876) reported finding several webs which "consisted of a wedge-shaped segment" near Mendoza, the type locality of this species. Morphological modifications characteristic of this genus and species make its members likely candidates for the production of such apparently secondarily reduced webs.

Orinomana Strand
Figures 120–128; Map 1

Orinomus [preoccupied] Chamberlin, 1916, Bull. Mus. Comp. Zool., 60(6): 206. Type species by original designation and monotypy *O. lamprus* Chamberlin, 1916, *ibid.* Preoccupied by *Orinomus* Attems 1895, S.B. Akad. Wiss. Wien, Math.-naturw. Cl., 104(1): 166.—Myriapoda.

Orinomana Strand, 1934, Folia zool. hydrobiol., 6(2): 273. New name for *Orinomus* Chamberlin, 1916, preoccupied. The genus name is feminine.

Note. Mello-Leitão established the genus *Petrunkevitchia* for *P. venusta* Mello-Leitão, 1915, *op. cit.* To this genus was added *P. pusilla* Mello-Leitão, 1917, Arch. Esc. super. agric. medic. vet., 1(1): 3–19. Each species was described from a single male specimen which apparently no longer exists. Despite this, Lehtinen (1967) treats this genus as a senior synonym of *Orinomana* Strand, 1934 (*nom. nov.* for the preoccupied *Orinomus* Chamberlin, 1916, *op. cit.*, containing only the type species *O. lamprus* Chamberlin). However he considers *P. pusilla* not to be congeneric with *P. venusta*, but fails to assign it to another genus. On the following page (258) Lehtinen places *O. lampra* in the genus *Philoponella*. Owing to this confusion and inability to resolve the problem due to lack of specimens of *P. venusta* and *P. pusilla*, I have chosen to treat these two species and, therefore, the genus *Petrunkevitchia* as *nomina dubia*. The 1964 International Code of Zoological Nomenclature defines a *nomen dubium* as: "A name not certainly applicable to any known taxon." Mayr (1969) adds: ". . . owing to shortcomings in the original diagnosis or the type material."

Diagnosis. Orinomana females, along with those of *Waitkera* and *Sybota*, have prominent PLE tubercles (Fig. 121). *Orinomana* is distinguished from these genera by having: 1. a peaked (Fig. 122) rather than an oval (Fig. 24) or projecting (Fig. 102) abdomen, and 2. AMEs which are not on a slight, median mound and which are one diameter removed from the anterior carapace margin (Figs. 120, 121).

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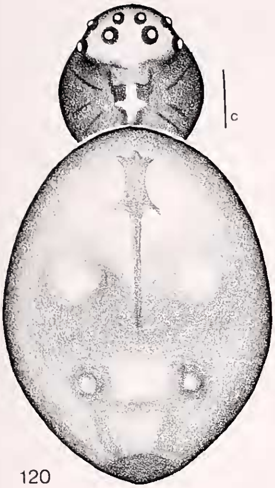
Figures 120–125. *Orinomana bituberculata* (Keyserling). 120. Dorsal view of female. 121. Female carapace. 122. Lateral view of female abdomen. 123. Ventral view of epigynum. 124. Posterior view of epigynum. 125. Dorsal view of cleared epigynum. Figures 126–128. *Orinomana mana* n. sp. 126. Ventral view of epigynum. 127. Posterior view of epigynum. 128. Dorsal view of cleared epigynum. Figures 129–130. *Uloborus glomosus* (Walckenaer). 129. Apical view of left male palpus. 130. Dorsal view of cleared epigynum. Figure 131. *Uloborus penicillatus* Simon, dorsal view of male left first femur.



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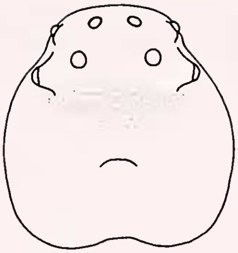

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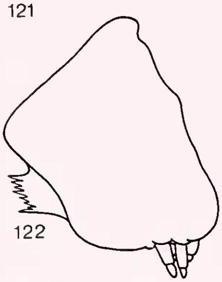

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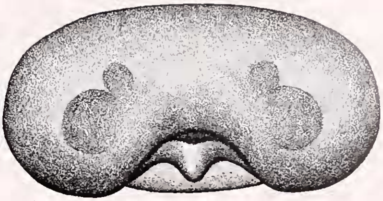

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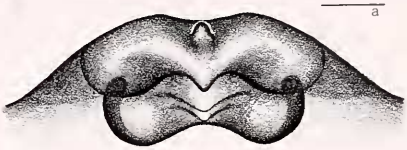

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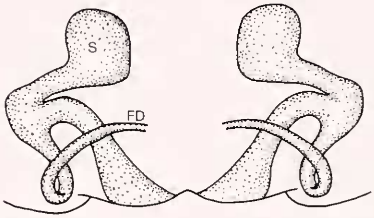

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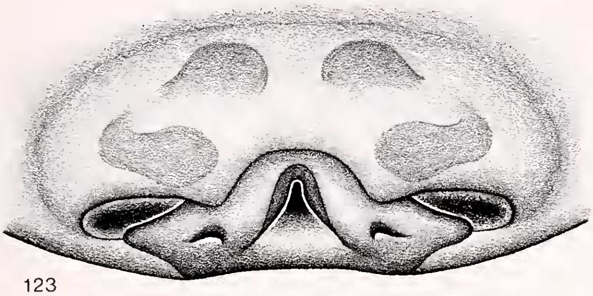

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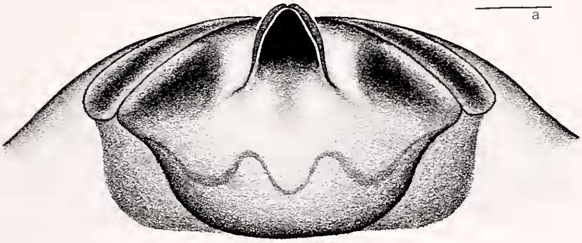

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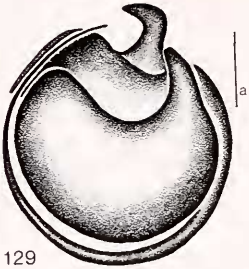

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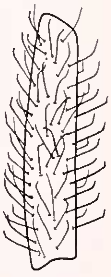

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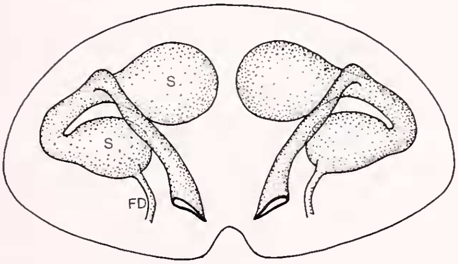

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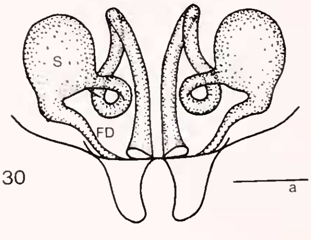

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Description. Carapace width and length equal. Cephalic region rises sharply from shallow thoracic depression and thoracic region slopes abruptly to petiole. The PLEs are on conspicuous lateral tubercles and the entire ocular area is on a distinct mound (Fig. 121). At ALEs cephalic region 0.6 carapace width. Both eye rows recurved so that a line across the median eyes' posterior margin passes through the anterior one-fourth of the lateral eyes' diameter. Median ocular area's anterior width three-fifths and its length three-sevenths its posterior width. In dorsal view clypeus extends forward of AMEs by a distance equal to one AME diameter. In anterior view clypeus height four-fifths an AME diameter. Sternum 0.6 as wide as long. Female palpal femur flattened. First femur 1.4 times as long as carapace. Calamistrum 0.7 times as long as metatarsus IV. Abdomen height and length nearly equal, width two-thirds to three-fourths length (Figs. 120, 122). Dorsum with a pair of large anterior tubercles and two pairs of small, paramedial tubercles posterior to these. Two stout tracheal trunks extend into cephalothorax.

Epigynum. Epigynum with a posteromedian notch or indentation and a pair of posterolateral depressions (Figs. 123, 124, 126, 127). An opening is found in each depression and the straight duct leading from it divides to connect to blind anterolateral spermatheca and either a long fertilization duct or a posterior spermatheca with a posteromedian fetilization duct (Figs. 125, 128).

Natural History and Distribution. Nothing is known of the natural history of this genus. Its members are found in the high Andes (3000 to 4000 m) from southern Ecuador to northern Chile.

KEY TO FEMALES OF *ORINOMANA*
(No males of this genus are known)

1. Sternum uniform brown; posterior epigynal margin with a sharp, V-shaped median notch (Fig. 123); abdomen white (Fig. 120) .... *bituberculata*

– Sternum brown with a light median stripe; posterior epigynal margin with a rounded median indentation (Fig. 126); abdomen darkly colored .... *mana*

Orinomana bituberculata (Keyserling), new combination
Figures 120–125

Uloborus bituberculatus Keyserling, 1882, Verh. zool.-bot. Ges. Wien, 31: 282. Two identified females from Peru in a vial labeled "type" in British Museum (Natural History), examined. Two identified females in vial labeled "Lima, Peru, leg. K. Yebki? Y. Sublemaa? detm. E. Keyserling, 177," in Polska Akademia Nauk Instytut Zoologiczny, Warsaw where Keyserling (1882 *op. cit.*) noted specimens to be, examined.

Orinomus lamprus Chamberlin, 1916, Bull. Mus. Comp. Zool., 60(6): 207. Female holotype from Urubamba (3160 m), Peru, collected 1919, in the Museum of Comparative Zoology, examined, NEW SYNONYMY.

Orinomana lampra:—Strand, 1934, Folia zool. hydrobiol., 6(2): 273.

Diagnosis. Orinomana bituberculata females are distinguished from those of *O. mana* by having a brown, unmarked sternum, a white abdomen (Fig. 120), a sharply notched posterior epigynal margin (Fig. 123), and two pairs of oval spermathecae (Fig. 125).

Description. Only females are known. Total length 4.8 mm, carapace length 1.2 mm, sternum length 0.8 mm. Carapace mottled brown with thin, light median stripe, a light ocular area with black encircled eyes, and a thin, light lateral margin (Fig. 120). Leg I tan mottled with gray; femur and tibia with faint proximal and median light rings; proximal two-thirds of metatarsus nearly white. Abdomen white with faint gray patches lateral to each dorsal tubercle (Fig. 120).

Epigynum. In ventral view (Fig. 123) posterior epigynal margin with a deep median notch and two broad, lateral depressions. Posterior epigynal surface (Fig. 124) nearly flat except for ventromedian notch. Two pairs of nearly equal-sized oval spermathecae (Fig. 125).

Distribution. This species is known only from the type locality in central Peru and from a female collected at Cerro Tinajillas (3100 m) in the southern Ecuadoran province of Azuay on 18 to 21 March 1965 by L. Peña.

Orinomana mana n. sp.
Figures 126–128

Type. Female holotype from Quismaa (ca. 4000 m) in the Chilean province of Tarapace, collected 5 June 1968 by L. Peña, in the Museum of Comparative Zoology. The specific name is an arbitrary combination of letters.

Diagnosis. *Orinomana mana* females are distinguished from those of *O. bituberculata* by having a light median sternal stripe, a darkly marked abdomen, a rounded posteromedian epigynal indentation (Fig. 126), and a single pair of spermathecae (Fig. 128).

Description. Only females are known. Total length 3.8 mm, carapace length 1.1 mm, sternum length 0.8 mm. Carapace coloration similar to *O. bituberculata* but the median stripe is broader and the lateral ocular area is brown not white. Carapace gray with a light median stripe. Leg I light brown with a light median femoral and a proximal tibial ring and a brown metatarsus. Dorsum of abdomen white overlain by dense black mottling to form a dark, median stripe and a dark chevron between each pair of light, dorsal tubercles. Venter of abdomen black with a thin median and a wide paraxial light stripe.

Epigynum. In ventral view (Fig. 126) posterior epigynal margin with a rounded median indentation containing two small central projections. In posterior view (Fig. 127) these projections appear dorsally directed. A single pair of spermathecae is present (Fig. 128).

Distribution. Known only from the type locality in northern Chile.

Uloborus Latreille
Figures 129–156, Plate 7-A; Map 2

Uloborus Latreille, 1806, Genera Crustaceorum et Insectorum, Aranéides, 1: 109, Paris. Type species by monotypy *U. walckenaerius* Latreille, 1806, *ibid.* Type specimens no longer exist.

Phillyra Hentz, 1850, Boston J. Natur. Hist. Soc., 6: 24. Type species by virtue of first listing in publication *P. mammeata* Hentz, 1850, *ibid.* The holotype of *P. mammeata* does not exist, but this species has long been recognized as a synonym of *Uloborus glomosus* (Walckenaer).

Veleda Blackwall, 1859, Ann. Mag. Natur. Hist., ser. 3, 3: 95. Type species by monotypy *V. lineata* Blackwall, 1859, *ibid.* The type species is a synonym of *U. walckenaerius.*

Philoponus Thorell, 1887, Ann. Mus. Civ. stor. nat. Genova, ser. 2, 5: 127. Type species by monotypy *Philoponus pteropus* Thorell, 1887, *ibid.*

Diagnosis. *Uloborus* males are distinguished by having: 1. a pear-shaped carapace with conspicuously narrowed cephalic region which is two-fifths the maximum carapace width (Figs. 133, 141, 150), 2. a posterior eye row recurved such that a line across posterior margin of PMEs passes anterior to the PLEs by half a PLE diameter, 3. clypeus height equal to half an AME diameter, 4. a conductor with only a proximal lobe (Plate 7-A, Fig. 129) and 5. numerous trichobothria on the first pairs of legs (Fig. 131). Females are similar to those of *Octonarius*, having slender posterolateral epigynal lobes whose bases are contiguous (Figs. 137, 145). Unlike *Octonarius*, they: 1. lack conspicuous posterodorsal atria (Figs. 138, 146), 2. have a cephalic region which at the ALEs is only half as wide as the carapace (Fig. 132), 3. have more conspicuously recurved eye rows, and 4. have a tuft of setae on distal region of the first tibia (Figs. 136, 153).

Description. Carapace width equal to 0.85 length. Cephalic and thoracic regions of females level, thoracic depression a shallow pit. Cephalic region of males curved slightly downward from thoracic depression. Both eye rows recurved. A line across AMEs' posterior margins passes anterior to the ALEs by a distance equal to one-fourth an ALE diameter in females and one ALE diameter in males. A line across PME's posterior margins passes anterior to the PLEs by a distance equal to one-fourth a PLE diameter in females and half a PLE diameter in males. Median ocular area is square. In anterior view clypeus height equal to two-fifths to half an AME diameter. Sternum width 0.72 its length. Female palpal femur laterally compressed. Length of first femur 1.4 to 1.5 that of carapace. Female calamistrum half as long as metatarsus IV. Female first tibia with a distal tuft of setae forming a conspicuous brush. Male first femur with two prolateral, two retrolateral, and two dorsal spines. Male first tibia with ten prolateral, six retrolateral, and 12 dorsal spines. Female abdomen three-fourths as high and half as wide as long, usually with one pair of dorsal tubercles in the anterior third of its length. Male's abdomen half as wide and high as long and without tubercles. Tracheal system with either two or four stout tracheal trunks extending into cephalothorax.

Male Palpus. Femur with a pair of proximal, ventral tubercles and tarsus with a prominent middle hematodocha (Plate 7-A). Median apophysis bulb well developed and bears a terminal median apophysis spur. Conductor arises from median apophysis bulb's base and lacks the distal spur present in *Philoponella* males. In *U. segregatus* and *U. campestratus* the conductor is as long as broad (Figs. 143, 151); whereas, in *U. penicillatus* it is much longer than broad (Fig. 135).

Epigynum. Two weakly sclerotized posterolateral lobes extend from epigynum's posterior margin (Figs. 137, 154). A small sclerite is usually found at the tip of each lobe and a copulatory opening is found dorsal or dorsolateral to the base of each lobe. Each opening leads via a duct to an oval spermatheca from whose posterior margin a fertilization duct leads (Figs. 130, 139, 147, 156).

Natural History and Distribution. As far as is known, all members of this cosmopolitan genus spin horizontal orb-webs.

Note. *Uloborus festivus* Mello-Leitão female holotype is an immature specimen, *U. orsinus* Mello-Leitão female holotype has no abdomen, and *U. peruvanus* Keyserling female holotype has been dried and its genitalia cannot be studied. These three species must be treated as *nomina dubia*.

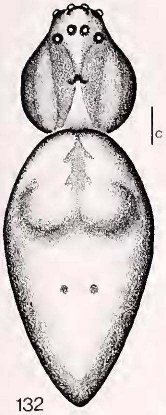
Confusion over the large number of *Uloborus* species names in the literature (most appearing only in original species descriptions and many belonging to what are now recognized as other genera) seems to have prevented many arachnologists from ascribing any name at all to members of this genus. Although the three *Uloborus* species redescribed in this study are clearly distinct from one another, each includes considerable color variability and may actually represent several sibling species which I am unable to distinguish at this time. This seems most likely in *U. aegrotus* and least likely in *U. cinereus*. With synonyms accounted for and the following three species delineated, names can be consistently ascribed to specimens and, as more information becomes available, the validity of the species described here more rigorously tested.

KEY TO *ULOBORUS* MALES

1. Conductor lobe at least four times as long as wide (Fig. 135); carapace usually with three light stripes (Fig. 133) ____ *penicillatus*

→

Figures 132–139. *Uloborus penicillatus* Simon. 132. Dorsal view of female. 133. Dorsal view of male. 134. Ventral view of male left palpal femur. 135. Apical view of male left palpus. 136. Retrolateral view of female left first leg. 137. Ventral view of epigynum. 138. Posterior view of epigynum. 139. Dorsal view of cleared epigynum. Figures 140–147. *Uloborus segregatus* Gertsch. 140. Dorsal view of female. 141. Dorsal view of male. 142. Dorsal view of male. 143. Apical view of male left palpus. 144. Ventral view of male left palpal femur. 145. Ventral view of epigynum. 146. Posterior view of epigynum. 147. Dorsal view of cleared epigynum. Figures 148–156. *Uloborus campestratus* Simon. 148. Dorsal view of female. 149. Dorsal view of female abdomen. 150. Dorsal view of male. 151. Apical view of male palpus. 152. Ventral view of male left palpal femur. 153. Retrolateral view of male left first leg. 154. Ventral view of epigynum. 155. Posterior view of epigynum. 156. Dorsal view of cleared epigynum.



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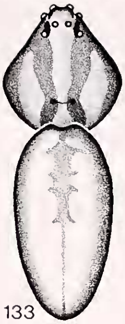

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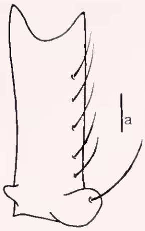

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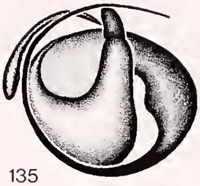

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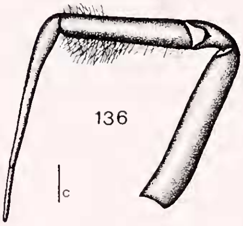

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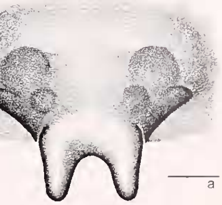

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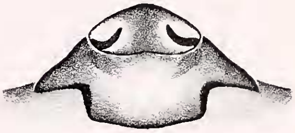

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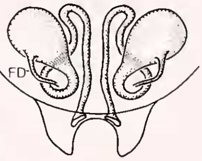

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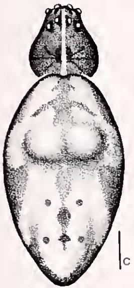

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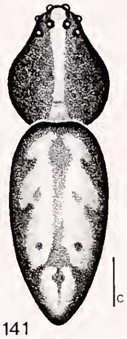

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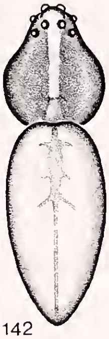

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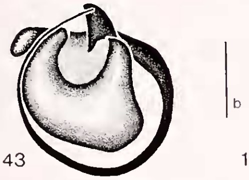

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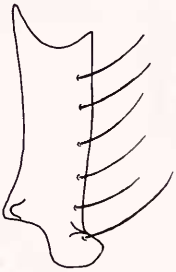

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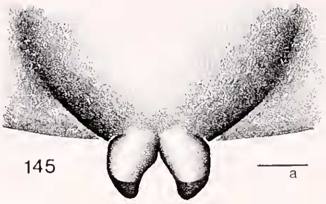

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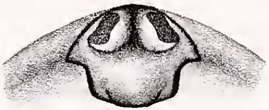

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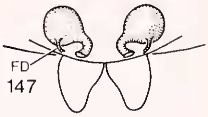

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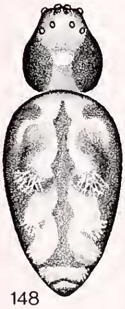

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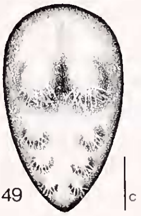

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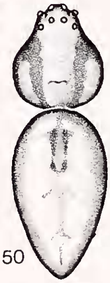

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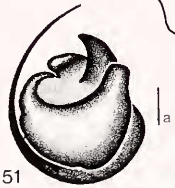

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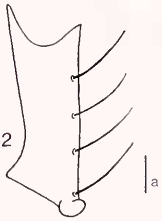

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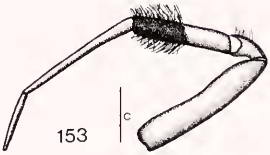

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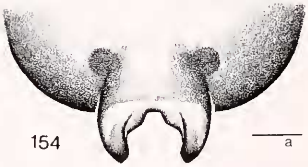

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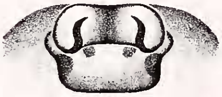

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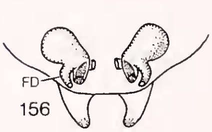

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– Conductor lobe as long as wide (Figs. 143, 151); carapace with a single median stripe (Fig. 141) or, if with three stripes a central guanine spot is present (Fig. 150) 2

2(1). Carapace with a central guanine spot (Fig. 150); median stripe broad; median apophysis bulb crescent-shaped, its prolateral notch twice as broad as deep (Fig. 151) .... *campestratus*

– Carapace without a central white spot (Fig. 141, 142); median stripe narrow; median apophysis bulb semicircular, its prolateral notch as broad as deep (Fig. 143) .... *segregatus*

KEY TO *ULOBORUS* FEMALES

1. Epigynal lobes separately connected to epigynal mound with their bases contiguous, forming a deep median "V" (Fig. 145); each lobe usually has a large, heavily sclerotized cap .... *segregatus*

– Epigynal lobes have a common connection to epigynal mound with their bases forming a shallow median "U" (Fig. 137) or their bases separated from one another (Fig. 154); lobes with common base lack a large distal cap 2

2(1). Carapace with a large, central guanine spot and often with a broad, central light median stripe (Fig. 148); abdomen usually with four pairs of dorsal humps, each hump beset with a tuft of thick white setae (Figs. 148, 149); first tibia with a dark, distal band which in a few lighter specimens is very faint (Fig. 153) .... *campestratus*

– Carapace without a white spot, lighter specimens have a narrow median white stripe and two paraxial white stripes (Fig. 132), darker specimens have only a central white stripe or a white posteromedian wedge; abdomen with only a single pair of anterior humps (Fig. 132); tibia 1 unmarked (Fig. 136) or, in dark specimens with a very narrow proximal band .... *penicillatus*

Uloborus penicillatus Simon, new combination

Figures 131–139; Map 2

Uloborus penicillatus Simon, 1891, Proc. Zool. Soc. London, 1891: 554. Three female, one male, and immature syntypes (in three vials) from the British West Indies island of St. Vincent, collected by H. H. Smith, in the British Museum (Natural History), examined.

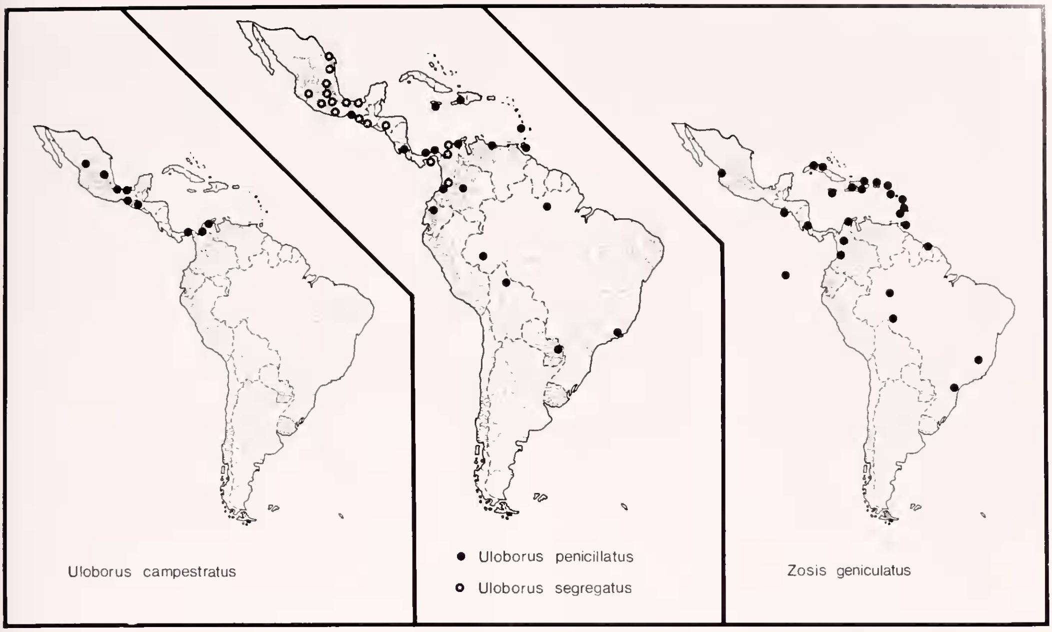
Uloborus aegrotus Simon, 1893, Ann. Soc. ent. France, 61: 424. Three female and three immature syntypes from Caracas and San Esteban, Venezuela, collected 27 December 1887 to 20 January 1888 and 29 February to 27 March 1888, respectively by E. Simon, in Muséum National d'Histoire Naturelle, Paris, examined. NEW SYNONYMY.

Uloborus maniculatus Simon, 1893, Ann. Soc. ent. France, 62: 299. Two female and one immature syntypes from San Paulo de Olivenca (de Mathan) in the Brazilian state of Amazonas, AR 45, in the Muséum National d'Histoire Naturelle, Paris, examined, NEW SYNONYMY.

Uloborus bucki Mello-Leitão, 1943, Arquivos do Museu Nacional, Rio de Janeiro, 37: 157. Female holotype from Porto Algere, Rio Grande do Sul, Brazil, collected by P. Buck, in Museu Nacional, Rio de Janeiro (No. 41. 720), examined, NEW SYNONYMY.

Uloborus plumipedatus Roewer, 1951, Abh. Nat. Ver. Bremen, 32(2): 154. New name for *U. plumipes* Mello-Leitão, 1947, Boletin Museu Nacional, Rio de Janeiro, 80: 6. Preoccupied by *U. plumipes* Lucas, 1846, Explor. Sci. Algérie, Zool. 1. Aranéides, p. 252. Two female, one immature, and two male syntypes from Garmo do Rio Claro in the Brazilian state of Minas Gerais, collected by J. C. Carvalho, in the Museu Nacional, Rio de Janeiro, examined, NEW SYNONYMY.

Diagnosis. In many respects this species is similar to *U. glomosus* from North America (Muma and Gertsch, 1964). Males are distinguished by having a conductor which is about five times as long as wide (Fig. 135) rather than three times as long as wide (Fig. 129) and by having a small median apophysis bulb with a deep prolateral notch (Fig. 135) rather than a large median apophysis bulb with a shallow notch (Fig. 129). Males are more easily distinguished from those of *U. segregatus* and *U. campestratus* by their long conductor (Fig. 135) and by the presence of small, less erect setae on the shaft of the palpal femur (Fig. 134). *Uloborus penicillatus* females are more difficult to distinguish from those of *U. glomosus*. The former usually lacks a proximal light tibial ring in all but dark specimens; whereas, most specimens of the latter have a conspicuous, though narrow, proximal light tibial ring. Epigynal lobes of *U. penicillatus* unite medially before joining the epigynal (Fig. 137) mound while those of most *U. glomosus* unite at the epigynal mound. *Uloborus penicillatus* females also differ from those of *U. segregatus* and *U. campestratus*, whose epigynal lobes unite at the epigynal mound (Fig. 145) or are separate at their attachment with the epigynal



Map 2. Distribution of *Uloborus campestratus*, *U. penicillatus*, *U. segregatus*, and *Zosis geniculatus*.

mound (Fig. 154). *Uloborus penicillatus* females lack the carapace guanine spot (Fig. 148), dark, distal tibial ring (Fig. 153), and four pairs of abdominal tubercles (Figs. 148, 149) found in *U. campestratus*. Epigynal lobes of *U. penicillatus* (Fig. 137) lack well sclerotized tips present in most *U. segregatus* specimens (Fig. 145).

Description. Female total length 4.4 to 7.2 mm, carapace length 1.4 to 1.7 mm, sternum length 0.8 to 1.2 mm. Male total length 3.0 to 4.2 mm, carapace length 1.1 to 1.3 mm, sternum length 0.6 to 0.9 mm. Female carapace tan to dark gray, lighter specimens with a light narrow median stripe and two light paraxial stripes (Fig. 132), darker specimens with only a median stripe. Male carapace tan with light median and paraxial stripes (Fig. 133). Female abdomen tan (Fig. 132) to dark gray. Male abdomen usually tan (Fig. 133), in a few specimens dusty gray. Two stout tracheal trunks extend into cephalothorax.

Male Palpus. Palpal femur's large retrolateral tubercle (Fig. 134) directed more perpendicular to femur's axis than in *U. segregatus* or *U. campestratus* (Figs. 144, 152). All setae but the one arising from the tubercle's tip smaller and less erect than in the other two species. Median apophysis bulb small with a deep prolateral notch (Fig. 135). Conductor at least five times as long as broad.

Epigynum. Epigynal lobes slender uniting at their bases to form a "U" which is often lighter than the remainder of the epigynum to which the lobes' common base attaches (Figs. 137, 138). Spermathecae oval, ducts long and convoluted (Fig. 139).

Natural History and Distribution. As far as is known members of this species construct tubular eggsacs with lengths at least ten times their diameters. This species is known from southern Mexico through Central America to Ecuador, Paraguay, and southeastern Brazil (Map 2).

Uloborus segregatus Gertsch
Figures 140–147; Map 2

Uloborus segregatus Gertsch, 1936, Amer. Mus.

Novitates, 852: 4. Male holotype and two male paratypes from Edinburg, Texas, collected 16 September 1935 by S. Mulaik. Two female paratypes from five miles SE of Welasco, Texas, collected 21 July 1935 by S. Mulaik. In the American Museum of Natural History, examined. Muma and Gertsch, 1964, Amer. Mus. Novitates, 2196: 26.

Diagnosis. As Muma and Gertsch (1964) note, males of this species are distinguished from those of *U. diversus* by having a palpal femur which is 2.5 rather than 4.5 times as long as broad. Females lack a dark, distal tibial ring present in *U. diversus. Uloborus segregatus* males differ from those of *U. penicillatus* by having a short conductor (Fig. 143), erect setae on the palpal femoral shaft (Fig. 144), and a single longitudinal stripe on the carapace (Figs. 141, 142). They differ from *U. campestratus* males by lacking a central white spot on the carapace's center and by having a larger retrolateral palpal femoral tubercle. *Uloborus segregatus* females are distinguished from those of *U. penicillatus* by having epigynal lobes which unite to form a "V" rather than a "U," and have sclerotized tips (Figs. 145, 146) and from those of *U. campestratus* by lacking a central guanine spot at the carapace's center and a dark, distal ring on the first tibia.

Description. Female total length 2.8 to 4.2 mm, carapace length 0.8 to 1.4 mm, sternum length 0.6 to 0.9 mm. Male total length 2.4 to 3.0 mm, carapace length 0.8 to 1.0 mm, sternum length 0.5 to 0.6 mm. Female and male carapace gray with a light median stripe. Abdomen of most females and darker males light dorsally and gray laterally with a complete or broken median gray stripe (Figs. 140, 141). Lighter males with a tan abdomen. Four stout tracheal trunks extend into the cephalothorax.

Male Palpus. Femoral shaft with six large, erect setae (Fig. 144). Median apophysis with a deep prolateral notch (Fig. 143). Conductor length and width equal.

Epigynum. Epigynal lobes unite separately to epigynal mound with their bases contiguous (Figs. 145, 146). Each lobe usually has a conspicuous sclerotized cap. Spermathecae round, ducts short (Fig. 147).

Natural History and Distribution. Vials of several specimens contained stellate eggcases similar to that shown in Fig. 233. This species is found from southeastern Texas through Colombia (Map 2).

Uloborus campestratus Simon, new combination
Figures 148–156; Map 2

Uloborus campestratus Simon, 1893, Ann. Soc. ent. France, 61: 424. Nine female and three male (see Note) syntypes from La Guiara, Caracas, and San Esteban, Venezuela collected by E. Simon from 27 December 1887 to 27 March 1888 in Muséum National d'Histoire Naturelle, Paris, examined.

Uloborus cinereus O. Pickard-Cambridge, 1898, Biol. Cent.-Amer., Zool., Arachnida. Araneida, 1: 265. Two female syntypes from Teapa in the Mexican state of Tabasco, collected by H. H. Smith, in British Museum (Natural History), examined, NEW SYNONYMY. Muma and Gertsch, 1964, Amer. Mus. Novitates, 2196: 28.

Uloborus spernax O. Pickard-Cambridge, 1898, *op. cit.* Female holotype from Teapa in the Mexican state of Tabasco, collected by H. H. Smith, in the British Museum (Natural History), examined, NEW SYNONYMY.

Note. Type material of *U. campestratus* contained nine females conspecific with *U. cinereus* and *U. spernax* plus three males conspecific with *Philoponella fasciata*. Simon describes females before males, and for this reason, I assert my authority as first revisor in establishing the synonymy listed above.

Diagnosis. Males and females are distinguished from those of other species by the presence of a large, white guanine spot at the carapace's center (Figs. 148, 150). *Uloborus campestratus* females are the only members of this genus to have four pairs of dorsal abdominal tubercles (Figs. 148, 149) and a dark ring on the distal half of the first tibia (Fig. 153).

Description. Female total length 2.4

to 4.0 mm, carapace length 0.8 to 1.3 mm, sternum length 0.5 to 0.8 mm. Male total length 2.0 to 2.4 mm, carapace length 0.9 mm, sternum 0.4 mm. Female carapace light tan to gray (Fig. 148), darker specimens with a broad, median light stripe. Male carapace of darker specimens with a broad median and two posterior paraxial stripes (Fig. 150). Female abdomen light tan (Fig. 149) to light gray, darker specimens with a median gray stripe and a pair of lobed, paraxial white stripes extending laterally to abdominal tubercles (Fig. 148). Male abdomen tan, without dorsal humps. Four stout tracheal trunks extend into cephalothorax.

Male Palpus. Palpal femur's retrolateral tubercle (Fig. 152) smaller than that of *U. penicillatus* and *U. segregatus* (Figs. 134, 144). Median apophysis bulb small, with a broad, shallow prolateral notch (Fig. 151). Conductor length and width equal.

Epigynum. Epigynal lobes broad and medially, widely separated at bases (Figs. 154, 155). Spermathecae oval with short ducts (Fig. 156).

Distribution. Florida and Gulf Coast states through Central America to Venezuela (Map 2).

Purumitra Lehtinen
Figures 157–161; Map 1

Purumitra Lehtinen, 1967, Ann. Zool. Fennici, 4: 261. Type species by original designation and monotypy *Uloborus grammicus* Simon, 1893, Ann. Soc. ent. France, 62: 68. Male holotype from Manila, Philippine Islands, in Muséum National d'Histoire Naturelle, examined. The genus name is feminine.

Note. Three female and two male specimens of *P. grammicus*, collected from epiphytes in the rainforest near Kolonia, on the Micronesian island of Ponape by M. Sabath on 27 January 1970 (in the Museum of Comparative Zoology); allow females of this genus to be described for the first time.

Diagnosis. Females are distinguished from those of other uloborid genera by having an epigynum with eight ventral atria (Fig. 160). The palp of *Purumitra* males (Fig. 157), like those of *Zosis* (Plate 7-C) and *Octonoba* (Plate 6-C) has a tegular spur, but unlike *Zosis* they have a broad, concave median apophysis spur and a small, narrow tegular spur. Their anterior eye row is strongly recurved such that a line across the AMEs' posterior margins passes half an ALE diameter anterior to the ALEs rather than along the ALEs' anterior border as in *Octonoba.* Unlike the males of either genus, their large median apophysis bulb is flattened and its lateral surface has a sclerotized ridge running between two depressions. *Purumitra* males are smaller than those of *Zosis* and *Octonoba*, having a carapace length of less than 0.9 mm.

Description of Type Species. Female total length 3.0 mm, carapace length 0.8 mm, sternum length 0.6 mm. Male carapace length 0.8 mm, sternum length 0.4 mm. Length and width of female carapace equal, male carapace 0.84 as wide as long. In lateral view cephalic region of female carapace level and straight thoracic region slopes to petiole. In males carapace highest just anterior to thoracic depression, its cephalic region sloping downward to ocular area and its rounded thoracic region sloping to petiole. Both eye rows of females and posterior eye row of males recurved such that a line across median eyes' posterior margins passes through anterior quarter of posterior eyes' diameter (Fig. 159). Anterior eye row of males more strongly recurved so that such a line passes half an ALE diameter anterior to ALE anterior margin. Median ocular area nearly square, its length and anterior width four-fifths its posterior width. Clypeus in anterior view three-fifths AME diameter. Sternum of female 0.69 and of male 0.78 as wide as long. Female palpal femur not flattened. Female calamistrum half as long as metatarsus IV. Femur I of females 2.0 and of males 1.9 times carapace length. Abdomen teardrop-shaped (Fig. 159) without tubercles, its maximum width and height half its length and attained midway along its length. Coloration of males and females similar. Carapace very light tan with broad, brown paraxial stripes extending its full length (Fig. 159). Thoracic region with thin gray marginal stripes. Sternum tan with thin gray margins. Dorsum of abdomen white with a gray posterior tip, venter gray with a thin median longitudinal white stripe, and lateral abdominal surfaces white with a wide dorsal gray longitudinal stripe and a broken ventral gray longitudinal stripe. Numerous fine tracheoles extend into cephalothorax.

Male Palpus. No ventral femoral tubercles are visible. Broad cymbium with two apical macrosetae (Fig. 157). Small proximal portion of the tarsus includes a middle hematodocha and gives rise to a large, somewhat flattened median apophysis. Retrolateral face of median apophysis bulb with a heavily sclerotized, curved central ridge between two depressions (Fig. 157). Short, broad median apophysis spur with concave retrolateral depression. Embolus of intermediate length, supported along its proximal surface by a small tegular spur.

Epigynum. The heavily sclerotized ventral epigynal surface has a small anteromedian and a larger posteromedian atrium, each divided laterally by a thin median septum (Fig. 160). Also present are a pair of large, oval, anterolateral atria and a pair of smaller, triangular, posterolateral atria. An opening is located at each dorsolateral margin of the posterior median atria and leads via a very short duct to an oval spermatheca from whose posterior surface a fertilization duct arises (Fig. 161).

Natural History and Distribution. Nothing is known of this genus' natural history. Its only known species is found on central Pacific Islands of the Philippine and Caroline groups.

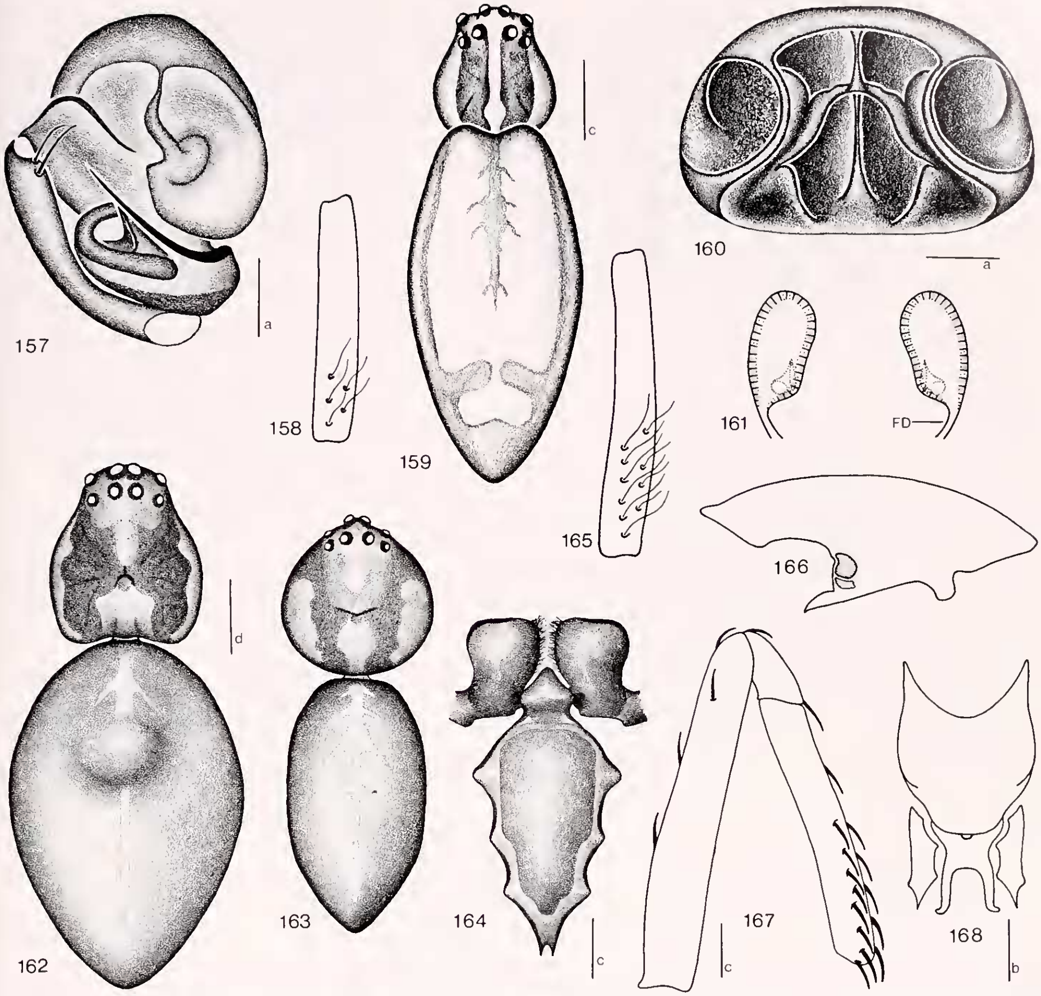
Zosis Walckenaer
Figures 2, 162–174, Plate 7-C; Map 2

Zosis Walckenaer, 1837, Histoire naturelle des Insectes, Aptères, Atlas: 12, pl. 20. Type species by monotypy *Zosis caraibe*. The genus name is masculine.

Orithyia Blackwall, 1858, Ann. Mag. Nat. Hist., 2(3): 331. Type species by original designation *Orithyia williamsii* Blackwall, 1858, *ibid.*

Diagnosis. Zosis males (Fig. 173, Plate 7-C) are distinguished by a large tubercle on the proximal, ventral surface of the palpal femur; a broad, flat tegular spur; a dome-shaped median apophysis bulb, and a clawlike median apophysis spur. Females are distinguished by broad, flattened epigynal lobes (Figs. 169, 170) which are medially separated, have posterolateral, triangular sclerites; and form a pair of posterior atria (Fig. 171) in which openings are found. Carapace (Figs. 162, 163) and leg (Fig. 174) color patterns are useful in distinguishing members of this genus.

Description. Female carapace width 0.8 carapace length, male carapace width 0.9 length. Female cephalic region rises only slightly from shallow thoracic depression, thoracic region flat. Conspicuous thoracic groove of males transverse and top of carapace flat, sloping anteriorly with ocular region lower than thoracic region. Female cephalic region at ALE half and male cephalic region 0.4 carapace width (Figs. 162, 163). Female clypeus height in anterior view half and male clypeus height one AME diameter. Anterior and posterior eye rows recurved, posterior such that a line across posterior margins of PME passes through anterior half of PLE diameter. Male AMEs on a mound and anterior eye row more strongly recurved than posterior (Fig. 163). In females the two rows about equally recurved (Fig. 162). Median ocular area nearly square. Sternum width 0.63 times length (Fig. 164). Prolateral surface of female palpal femur slightly flattened. Female first femur 1.8 times and male first femur 1.5 times as long as carapace. Fe-



Figures 157–161. *Purumitra grammica* (Simon). 157. Prolateral view of male palpus. 158. Dorsal view of female right first femur. 159. Dorsal view of female. 160. Ventral view of epigynum. 161. Dorsal view of cleared epigynum. Figures 162–168. *Zosis geniculatus* (Olivier). 162. Dorsal view of female. 163. Dorsal view of male. 164. Female sternum, endites, and labium. 165. Dorsal view of female right first femur. 166. Retrolateral view of female left first patella showing lyriform organs. 167. Prolateral view of male left first femur, patella, and tibia. 168. Dorsal view of female lorum.

male calamistrum half length of metatarsus IV. Male first femur with one distal prolateral and three dorsal macrosetae (Fig. 167). Tibia I with eight distal prolateral, seven retrolateral, and nine dorsal macrosetae. Width and height of female abdomen three-fifths its length, usually with a single, median tubercle in anterior third of its dorsum (Fig. 162). Male abdomen oval without tubercles, its height and width half its length (Fig. 163). Coloration of members of this genus is distinctive and given in detail under the species description. Tracheal system characterized by small tracheoles extending to cephalothorax (Fig. 2).

Male Palpus. Proximal ventral surface of femur with one small median and one large lateral tubercle (Plate 7-C). Two long setae project from the cymbium's tip. Middle hematodocha large and its dome-shaped median apophysis bulb bears a hooked median apophysis spur (Fig. 173, Plate 7-C). A broad, flat tegular spur serves as a guide for the embolus, running along its proximal surface and nearly meeting the median apophysis. The small, flat, unsclerotized lobe arising from the median apophysis bulb's center may be homologous with the well-formed conductors of *Philoponella*, *Ponella*, *Miagrammopes*, and *Uloborus*.

Epigynum. In ventral view two flattened, weakly sclerotized posterior lobes extend either posteriorly (Fig. 169) or ventrally (Fig. 170). Posterolateral or ventrolateral margins of the widely separated posterior lobes each have a triangular sclerite (Fig. 169). Posterior surface of each lobe forms an atrium at whose median margin an epigynal opening is located (Fig. 171). Dorsally, the two crypts merge and are bordered by the straight, ventral posterior plate border. In posterior view this plate is twice as wide as high. Duct leading from each epigynal opening loops twice before entering a spherical spermatheca from whose posterior surface a fertilization duct arises (Fig. 172).

Note. The cosmotropical species *Zosis geniculatus* is the only member of this genus I recognize for the New World. The smaller *Uloborus costalimae* Mello-Leitão, 1917 female which has a total length of 4.0 mm, a carapace length of 1.2 mm, and a median hump on the abdomen's dorsum may represent a second American species. However, the female holotype (and only specimen discovered in this study), collected from the Brazilian state of Alagoas by Costa Lima and housed in the Museu Nacional of Rio de Janeiro, Brazil, has been dried and is not in good enough condition to allow a useful redescription of this species.

Natural History and Distribution. This species appears to have good powers of dispersal, to be commonly associated with man-made structures, and to be quite resistant to desiccation. The latter two factors suggest that it may have been introduced into many areas through commerce. In the New World this cosmotropical species of orb-weavers is found from the Gulf Coast states of the United States through Central America and the West Indies, and into the northern two-thirds of South America.

Zosis geniculatus (Olivier)
Figures 2, 162–174, Plate 7-C; Map 2

Aranea geniculata Olivier, 1789, Araignée, Aranea. *in* Encycl. méth., Hist. nat., Inst. Paris, 4: 214.

Zosis caraibe Walckenaer, 1837, Histoire naturelle des Insectes, Aptères, Atlas: 12, pl. 20. Female holotype lost.

Uloborus zosis Walckenaer, 1841, Histoire naturelle des Insectes, Aptères, 2: 231.

Uloborus latreillei Thorell, 1858, Öfvers. Kongl. Vet. Akad. Förh., 15: 196.

Orithyia williamsii Blackwall, 1858, Ann. Mag. Nat. Hist., 2(3): 331. One male, one female, and one immature syntypes from Amboina Island, Amboina (Moluccas) Islands, bottle 161, tube 2, University Museum, Hope Department of Entomology, Oxford University, examined.

Uloborus domesticus Doleschall, 1859, Act. Soc. sci. Ind.-Neerl., 5: 46. Not with other Doleschall types in Rijksmuseum van Natuurlijke Historie, Leiden, Holland; presumed lost.

Uloborus williamsii:—O. Pickard-Cambridge, 1871, Proc. Zool. Soc. London, 1871: 617.

Uloborus geniculatus:—Thorell, 1890, Ann. Mus. civ. stor. nat. Genova, 10(2): 291. Bonnet, 1957, Bibliographia Araneorum, 2: 4762. Muma and Gertsch, 1964, Amer. Mus. Novitates, 2196: 37.

Zosis geniculatus:—Lehtinen, 1967, Ann. Zool. Fennici, 4: 277.

Description. Male total length 4.0 to 6.3 mm ($\bar{X} = 4.96$, SD = 0.77, N in all cases = 13). Carapace length 1.6 to 2.5

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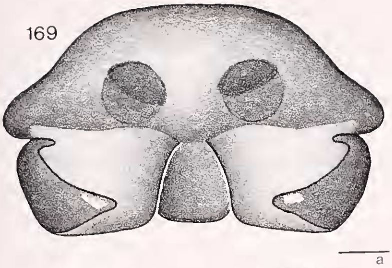
Figures 169–174. *Zosis geniculatus* (Olivier). 169, 170. Ventral view of epigynum. 171. Posterior view of epigynum. 172. Dorsal view of cleared epigynum. 173. Retrolateral view of male palpus. 174. Dorsal view of female left first femur, patella, and tibia. Figures 175–180. *Octonoba* species 3. 175. Female carapace. 176. Male carapace. 177. Retrolateral view of apical region of male left palpus. 178. Ventral view of epigynum. 179. Posterior view of epigynum. 180. Dorsal view of cleared epigynum.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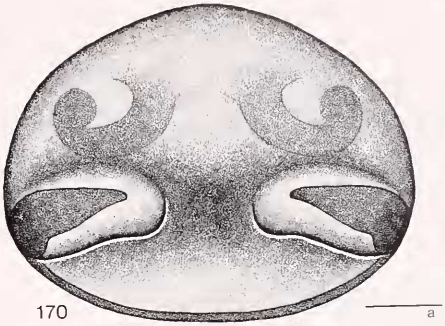
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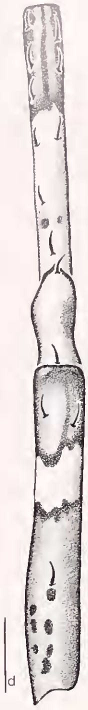
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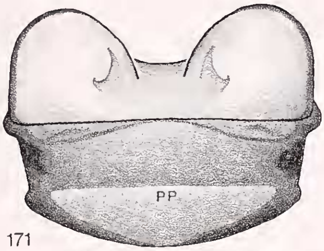
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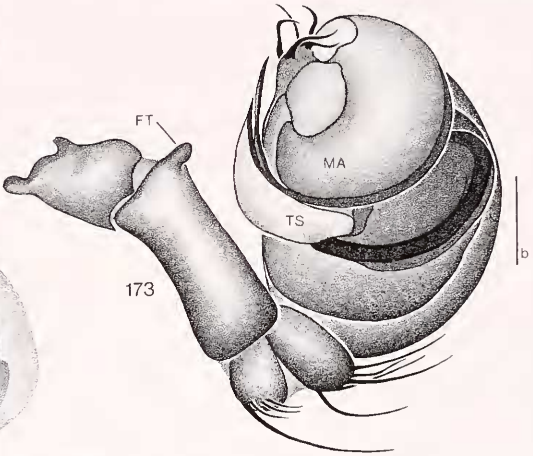
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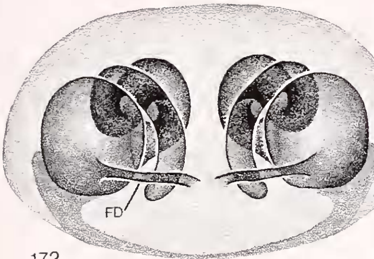
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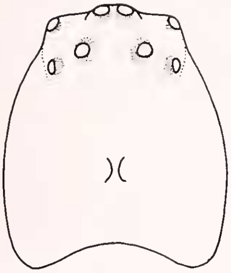
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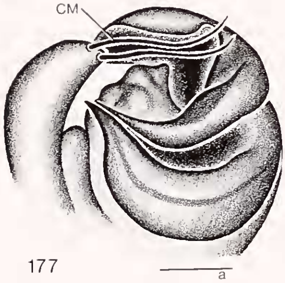
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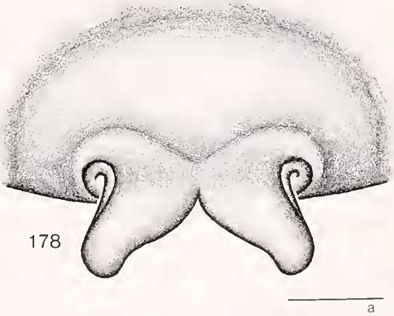
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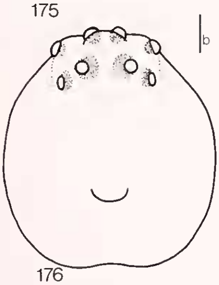
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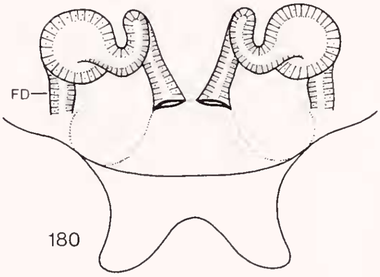
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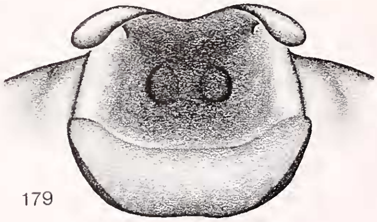
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mm ($\bar{X} = 2.03$, SD = 0.23), sternum length 1.0 to 1.5 mm ($\bar{X} = 1.20$, SD = 0.15). Female total length 6.3 to 8.4 mm ($\bar{X} = 7.21$, SD = 0.47), carapace length 2.0 to 2.6 mm ($\bar{X} = 2.35$, SD = 0.17), sternum length 1.2 to 1.8 mm ($\bar{X} = 1.52$, SD = 0.15, N in all cases = 15). Coloration of males and females similar (Figs. 162), 163). Carapace gray to reddish brown with light lateral margins, cephalic region, and posterior median region. Sternum tan, often slightly darker in center than at margins (Fig. 164). Coloration of all legs similar to first leg (Fig. 174) except for four to six dark spots on proximal region of femur which are found only on legs I and II. Matatarsi and tarsi brown with no conspicuous bands. Abdomen usually white without conspicuous markings.

Octonoba new genus

Figures 175–185, Plates 6-C, D, 7-D; Map 1

Type. The type species of this genus is *Uloborus octonarius* Muma, 1945, Proc. Biol. Soc. Washington, 58: 91. Male holotype and female paratype from College Park, Maryland, collected 7 July 1943 by W. F. Jeffers and M. H. Muma, in the American Musum of Natural History, examined. The genus name is an arbitrary combination of letters and is feminine.

Note. Examined material contained four distinct *Octonoba* species, of which I am able to identify only *O. octonaria.* Consideration of the remaining three Oriental species is necessary for an understanding of the genus. Designation of these as species 1–3 is done for clarity and is not an attempt to name any of these species. To do so without careful examination of the types of all Oriental species likely to belong to this genus would be unwise. Lehtinen (1967) synonymizes *U. octonarius* and *U. sinensis* Simon, 1880 from China, placing the newly combined species into the genus *Zosis.* To this genus he also adds *U. varians* Bösenberg and Strand, 1906 from China and Japan (which he synonymizes with *U. defectus* Bösenberg and Strand and *U. dubius* Bösenberg and Strand, 1906), *U. sybotides* Bösenberg and Strand, 1906 from Japan, *Argyrodes yesoensis* Saito, 1934 from Japan. Lehtinen also places *U. mundior* Chamberlin and Ivie, 1936; *U. costalima* Mello-Leitão, 1917; and *U. ursinus* Mello-Leitão, 1917 into the genus *Zosis.* Lehtinen indicates he did not examine type specimens of *U. octonarius* and I cannot accept his synonymy of *U. octonarius* and *U. sinensis.* Type specimens of *Uloborus ursinus* and *U. costalimae* were damaged (the former's abdomen lost and the latter dried) and cannot be treated with certainty. *Uloborus mundior* is a synonym of *Philoponella republicana.* I agree with Lehtinen that *U. octonarius* is more closely related to *Zosis* than to any other genus (except possibly *Purumitra*) and that it bears a striking resemblance to several Oriental species. However, I believe that these species are more related to one another than any one is to *Zosis geniculatus* and for this reason propose *Octonoba* as a new genus.

Diagnosis. *Octonoba* males are distinguished from those of all other uloborids except *Purumitra* by having both an enlarged, concave median apophysis and a conspicuous hematodocha (Plates 6-C, D; 7-D). *Octonoba* males are distinguished from those of *Purumitra* by having: 1. a carapace length greater than 1.4

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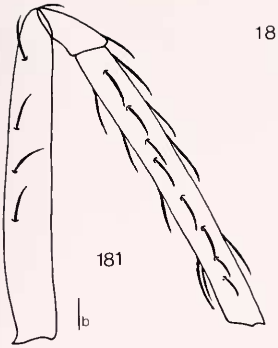
Figures 181–182. *Octonoba* species 3. 181. Retrolateral view of male left first femur, patella, and tibia. 182. Dorsal view of female right first femur. Figures 183–185. *Octonoba* species 1. 183. Prolateral view of male left first femur, patella, and tibia. 184. Ventral view of epigynum. 185. Posterior view of epigynum. Figures 186–191. *Daramuliana gibbosa* (L. Koch). 186. Female carapace. 187. Lateral view of female carapace. 188. Lateral view of female abdomen. 189. Ventral view of epigynum. 190. Dorsal view of cleared epigynum. 191. Dorsal view of female right femur. Figures 192–197. *Ponella lactescena* (Mello-Leitão). 192. Female carapace. 193. Male carapace. 194. Lateral view of female carapace. 195. Dorsal view of female. 196. Dorsal view of female right first femur. 197. Lateral view of female abdomen.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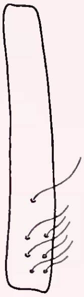
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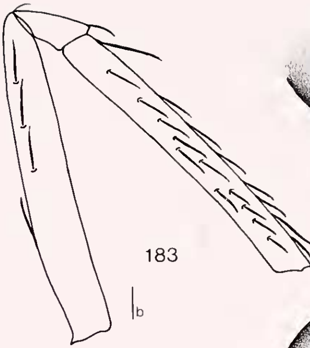
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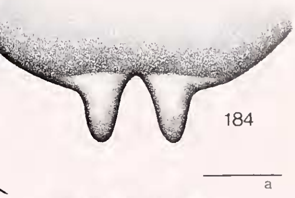
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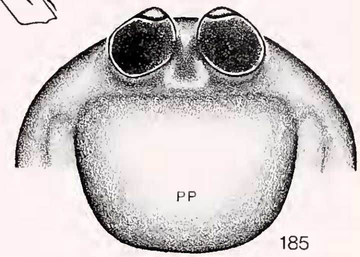
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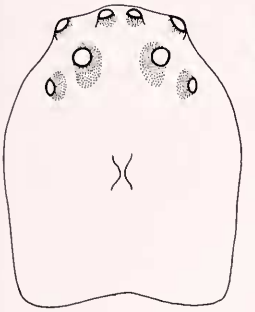
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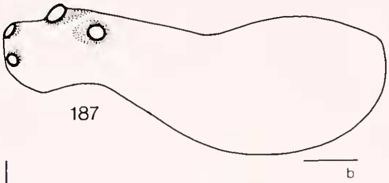
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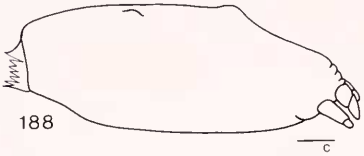
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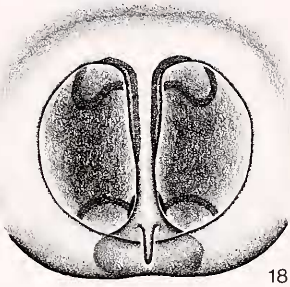
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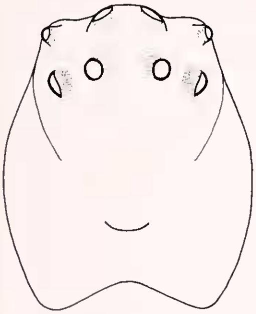
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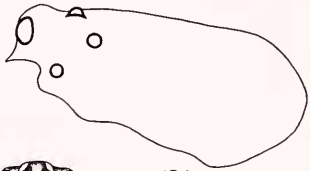
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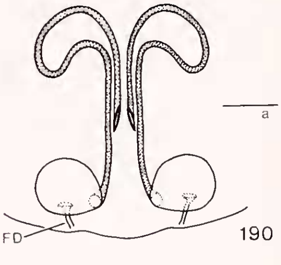
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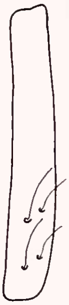
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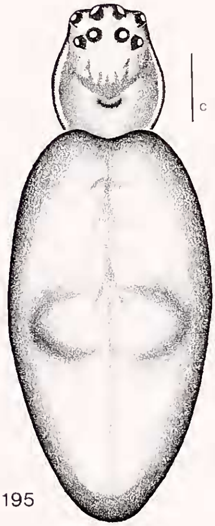
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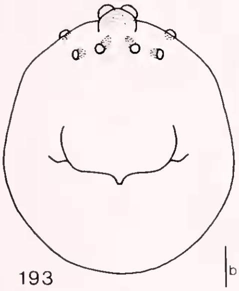
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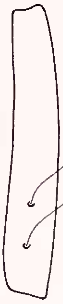
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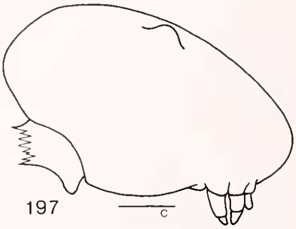
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mm rather than 0.9 mm or less, 2. first femur no greater than 1.7 (rather than twice) the carapace length, and 3. by having a more reduced median apophysis bulb. *Octonoba* and *Uloborus* females have slender, posterolateral epigynal lobes which are contiguous at their bases (Figs. 137, 145, 178, 184). The posterior eye row of *Octonoba* (Figs. 175, 176) recurved such that a line across the PMEs' posterior margins passes along the PLEs' anterior margins; whereas in *Uloborus* it passes at least one quarter PLE diameter anterior to the PLE (Figs. 132, 133). In *Octonoba* females the median ocular area's anterior width is 0.7 its posterior width; whereas the median ocular area of *Uloborus* is square. *Octonoba* females have a conspicuous atrium (Fig. 179) or pair of atria on the epigynum's posterodorsal surface (Fig. 185) which is absent in *Uloborus* (Figs. 138, 146).

Description. Female total length 4.2 to 5.2 mm, carapace length 1.5 to 1.6 mm, sternum length 0.9 to 1.0 mm. Male total length 4.0 to 4.8 mm, carapace length 1.4 to 1.8 mm, sternum length 0.8 to 1.0. Carapace width 0.85 to 0.88 its length. Cephalic and thoracic regions flat in lateral view, PMEs at the same height as shallow thoracic pit. At ALEs the cephalic regions' width two-thirds maximum carapace width in females and half in males (Figs. 175, 176). Both eye rows recurved such that a line across median eyes' posterior margins passes along anterior margin of lateral eyes (Figs. 175, 176). Median ocular area's anterior width and length 0.7 its posterior width. In anterior view clypeus height of males three-fifths an AME diameter and of females five-sixths an AME diameter. Sternum width 0.65 to 0.72 its length. First femur 1.50 to 1.65 times carapace length. Female palpal femur not flattened and calamistrum half as long as metatarsus IV. Male first femur with three to four prolateral, one to three retrolateral, and one dorsal macroseta (Figs. 181, 183). First tibia with 11 to 16 prolateral, three to four retrolateral, five to eight dorsal, and zero to five ventral macrosetae. Height and width of female abdomen 0.6 its length, with four pairs of small paramedian tubercles. Male abdomen half as wide and two-fifths to three-fifths as high as long. Carapace brown with a thin median light stripe and a pair of light, marginal, longitudinal stripes. Numerous fine tracheoles extend into cephalothorax.

Male Palpus. Femur with two nearly equal-sized proximal tubercles on a ventral mound (Plate 6-A, D). Two stout terminal spines extend from cymbium's tip. Middle hematodocha large and tegulum of two species a spur along embolus' proximal surface (Fig. 177, Plate 6-C). In *O. octonaria* (Plate 7-D) tegular spur small, apparently providing little support for embolus, but in species 1 where it is long and grooved (Plate 6-C), tegular spur probably affords some embolic support. In *O. octonaria* and species 1 median apophysis bulb is a small, convex, semicircular sclerite whose spur is enlarged and has a proximal surface that is either concave (species 1) (Plate 6-C) or rolled inward at the edges to form a tube (*O. octonaria*, Plate 7-D). A small irregular, unsclerotized lobe arising from the median apophysis bulb's center (Plate 7-D) may be homologous with the conductor of *Philoponella*, *Ponella*, *Miagrammopes*, and *Uloborus*. Reduction in size of the median apophysis bulb and tegular spur appears associated with enlargement of the median apophysis spur. This is seen when species 1 (Plate 6-C) and species 3 (Fig. 177), *O. octonaria* (Plate 7-D) and species 2 (Plate 6-D) are compared. In species 2 (Plate 6-D) where the median apophysis spur forms a U-shaped trough, the tegular spur is lost, and the median apophysis bulb reduced to a small, flat plate. The embolus of *O. octonaria* and species 1 is long and thin. That of species 2 (Plate 6-D) has a broad base and short central radix.

Epigynum. The epigynum consists of either: 1. a ventral mound with two posterolateral lobes, each with a dorsal, circular atrium at its base (Figs. 184, 185), or 2. a ventral mound with two posterior lateral lobes extending over a common posterior atrium (Figs. 178, 179). The latter condition is similar to that of *Zosis geniculatus* (Figs. 169–171) and it is interesting to note that the male tegular spurs of both species are broad and long. The convex posterior plate is one-fourth to three-fourths as high as broad (Figs. 179, 185). A duct leads from each atrium or from each lateral margin of the common atrium to a spherical spermatheca from whose posterior surface a fertilization duct arises (Fig. 180).

Natural History and Distribution. Octonoba octonaria spins an approximately horizontal orb-web similar to many other uloborids (Eberhard, in preparation). This species is known only from the United States where its range extends from Maryland through Alabama, north-central Texas, and eastern Kansas. Species 1 comes from Kunming in the southwestern Chinese province of Yunnan, species 2 from Okinawa, and species 3 from Taiwan.

Daramuliana Lehtinen
Figures 186–191; Map 1

Daramuliana Lehtinen, 1967, Ann. Zool. Fennici, 4: 227. Type species by original designation *Uloborus gibbosus* L. Koch, 1871, Arachn. Austral., 1: 1, 228. Female holotype from Upolus, Samoa, in Zoologisches Museum, Hamburg, examined. The generic name is feminine.

Diagnosis. Daramuliana females are characterized by having: 1. a medially divided, circular, ventral epigynal atrium (Fig. 189), 2. a carapace whose width is 0.75 its length (Fig. 186), and an abdomen which is 0.38 as wide as long and has a median, dorsal tubercle in the posterior 0.57 of its length (Fig. 188).

Description of Type Species. Female. Total length 4.0 to 4.6 mm, carapace length 1.3 to 1.5 mm, and sternum length 0.8 to 0.9 mm. Carapace width three-fourths carapace length. Cephalic and thoracic regions each slope upward from a shallow thoracic depression (Figs. 186, 187). At ALEs cephalic area half as wide as carapace. Both eye rows recurved, the anterior such that a line across AMEs' posterior margin passes through anterior quarter of ALEs' diameter and posterior such that a line across PLEs' posterior margin passes two-thirds a PLE diameter anterior to PLEs' anterior margin (Fig. 186). Median ocular area's anterior width half and its length two-thirds its posterior width. Clypeus height in anterior view two-fifths AME diameter. Sternum width 0.42 length. Female palpal femur slightly flattened. First femur twice as long as carapace. Calamistrum half as long as metatarsus IV. Abdomen width and height 0.38 length, median tubercle in posterior 0.57 of the its length (Fig. 188). Fine tracheoles arising from two stout tracheal trunks appear restricted to the abdomen.

Epigynum. On the epigynum's ventral surface is a medially divided circular atrium (Fig. 189). An epigynal opening is found at the posteromedian margin of each atrial half, near the base of a small scape on the median septum's posterior margin. From each opening a long, thin duct extends anteriorly and then loops posteriorly to connect to a spherical spermatheca from whose posterior margin a ferlization duct arises (Fig. 190).

Natural History and Distribution. Nothing is known of the natural history of the members of this genus. Its two recognized species (Lehtinen, 1967) have been collected on Australia, Samoa, and on Viti Levu in the Fiji Islands.

Ponella new genus
Figures 192–202; Map 1

Type. Type species *Uloborus lactescens* Mello-Leitão, 1947, Boletim do Museu Nacional (N.S.), Rio de Janeiro, Zoologia, No. 80: 4. The genus name is an arbitrary combination of letters and is feminine.

Diagnosis. Members of this genus have a total length of less than 3.0 mm. *Ponella* (Fig. 193), *Zosis* (Fig. 163), and

Philoponella (Figs. 205, 217) males have an oval carapace with a wide, transverse thoracic groove and AMEs on a small mound. *Ponella* males are distinguished by having a long, narrow conductor which lies along the embolus' distal surface, lacks a basal lobe, and has a slender, distal branch (Fig. 201). First tibia of males (Fig. 202) has three prolateral, three retrolateral, and four dorsal macrosetae—fewer than either *Zosis* or *Philoponella*. *Ponella* females are distinguished by having a pair of low, widely separated, ventral epigynal mounds anterior to which a pair of openings is found (Figs. 198, 199).

Description. Carapace about 0.9 times as wide as long. Male thoracic groove deep and transverse and carapace dorsally flat (Fig. 193), slanting forward so that cephalic region is much lower than thoracic region. Transverse female thoracic groove narrow but conspicuous (Figs. 192, 195), cephalic and thoracic regions about equal in height (Fig. 194). At level of ALEs female cephalic region 0.70 times and male cephalic region 0.60 times carapace width. Male AMEs on a small, prominent, anteriorly directed mound (Fig. 193), but in females this mound is not distinct (Fig. 192). Both eye rows recurved, the posterior only slightly so such that a line across posterior margins of PMEs passes through center of PLEs. Such a line across AMEs' posterior margins passes across anterior margins of ALEs of females and in males 1 to 1.5 ALE diameters anterior to ALEs. In anterior view female clypeus height half an AME diameter and in males two AME diameters. Median ocular area of females square and of males slightly longer than wide. Sternum width 0.67 its length. First femur 1.1 times as long as carapace in females and in males equal to carapace length. Female calamistrum half as long as metatarsus IV. Male first femur with one dorsal, two distal prolateral, and two distal retrolateral macrosetae. Female abdomen half as wide and two-thirds as high as long, with two dorsal humps at or slightly anterior to its center (Figs. 195, 197). Male abdomen oval without humps, its width and height two-thirds its length. Fine tracheoles extend into the cephalothorax.

Male Palpus. Femur with two proximal, ventral processes; a large lateral one and a smaller median one. No conspicuous macrosetae visible on distal cymbial rim. Middle hematodocha well developed giving rise to a median apophysis consisting of a flat bulb with a large lateral hooked spur (Fig. 201). Conductor with a short cylindrical proximal lobe and a long, thin distal branch about five times as long as wide and with proximal surface trough-shaped to receive the embolus.

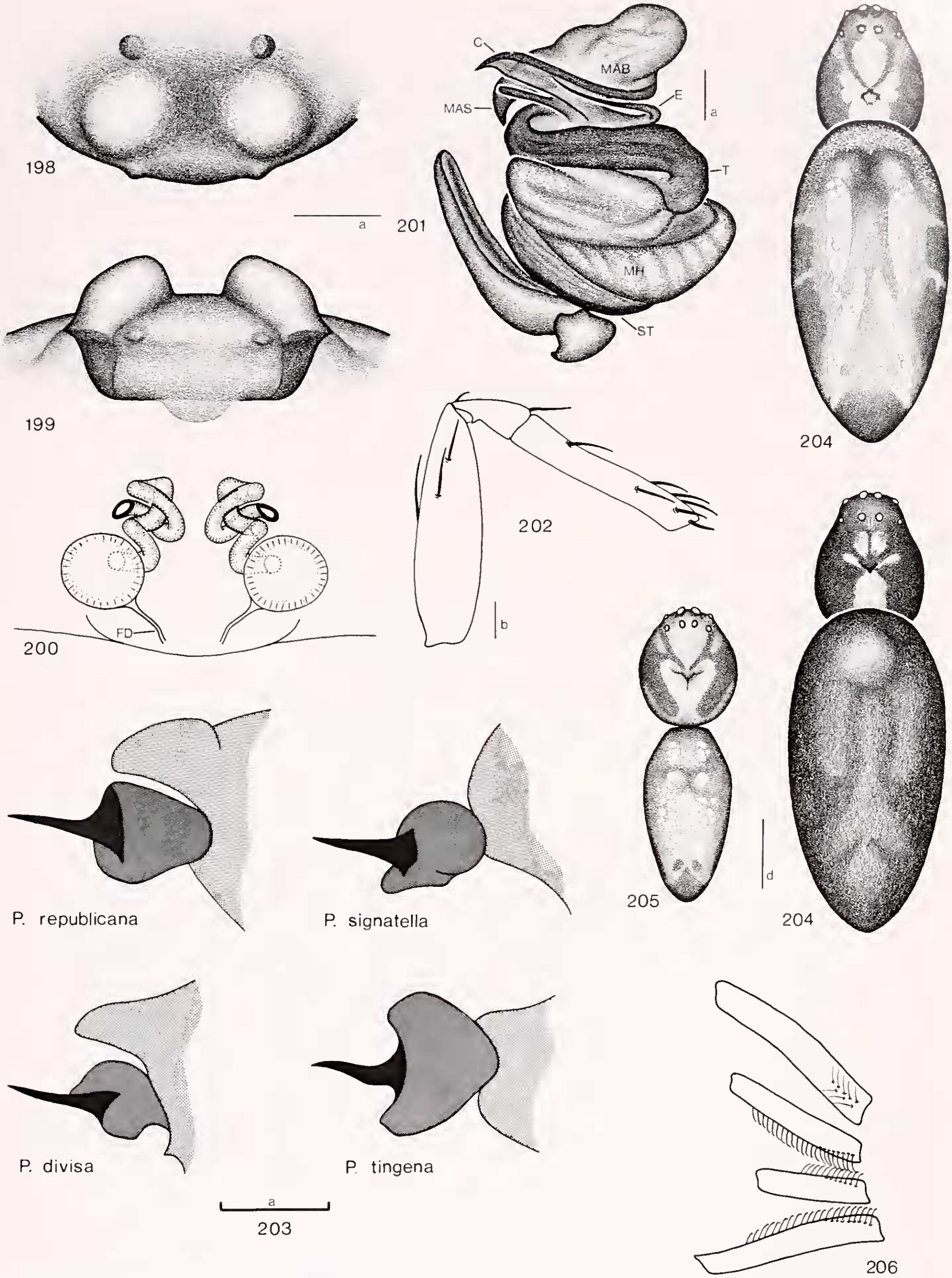
Epigynum. In ventral view (Fig. 198) two light, slightly raised posterior lobes appear near epigynum's posterior edge. Anterior to these is a pair of small, inconspicuous openings. In posterior view (Fig. 199) a posterior plate extends between the lobes and bears a pair of small midlateral bumps. From each opening a duct makes four loops before connecting with a large, thick-walled spermatheca from whose posterior margin a fertilization duct arises (Fig. 200).

Natural History and Distribution. The one described species of this genus has been collected from Paraguay and southern Brazil. One female was collected with a chain of three flat, stellate eggsacs, each about 4.0 × 2.8 mm.

Ponella lactescena (Mello-Leitão), new combination
Figures 192–202; Map 1

Uloborus lactescens Mello-Leitão, 1947, Boletim do Museu Nacional (N.S.), Rio de Janeiro, Zoologia, No. 80: 4. Immature female and one mature male syntypes from Carmo do Rio Claro in the Brazilian state of Minas Gerais, collected by J. C. M. Carvalho, in the Museu Nacional of Rio de Janeiro, Brazil, examined.

Description. Male. Total length 2.8 mm, carapace length 1.3 mm, sternum length 0.7 mm. Fourth coxae separated by a distance equal to the width of each. Carapace tan with no conspicuous color



Figures 198–202. *Ponella lactescena* (Mello-Leitão). 198. Ventral view of epigynum. 199. Posterior view of epigynum. 200. Dorsal view of cleared epigynum. 201. Retrolateral view of male left palpus. 202. Prolateral view of male left first femur, patella, and tibia. Figure 203. Apical views of left median apophysis spurs of *Philoponella republicana* species group. Figures 204–206. *Philoponella republicana* (Simon). 204. Dorsal view of female. 205. Dorsal view of male. 206. Dorsal view of female left femora, showing position of trichobothrial rows.

markings. Sternum tan with light gray anterior margin and center. Dorsum of abdomen light with flecks of white and with light gray posterior tip. Venter with gray patch between booklung covers and a broad, light gray median area. Legs tan.

Female. Total length 3.0 to 3.5 mm, carapace length 0.9 to 1.1 mm, sternum length 0.7 mm. Carapace light gray with narrow white border, lighter ocular region, and darker patch at posterior cephalic region (Fig. 195). Eyes encircled by dark gray rings. Sternum dark gray. Dorsum of abdomen light with no markings except gray posterior tip in some specimens. Venter dark gray with two think widely spaced white paraxial stripes running its entire length. Legs with no conspicuous color markings.

Distribution. Eastern Paraguay and southern Brazil.

Philoponella Mell-Leitão

Figures 1, 203–288, Plates 6-E, 7-B; Maps 3–5

Philoponella Mello-Leitão, 1917, Arch. Esc. Sup. Agr. Med. Veter., 1(1): 8. Type species by original designation and monotypy *Uloborus republicanus* Simon, 1891, Ann. Soc. ent. France, 60: 8. The genus name is feminine.

Note. Until Lehtinen, 1967, Ann. Zool. Fennici, 4: 258, resurrected this genus, the name *Philoponella* was not recognized by anyone other than its author. However, its first formal synonymy with *Uloborus* was by Roewer, 1954, Katalog der Araneae, 2(b): 1344. This genus corresponds with the *Uloborus republicanus* species group Muma and Gertsch, 1964, Amer. Mus. Novitates, 2196: 29. In addition to the type species, *U. republicanus*, this species group contained *U. variegatus*, *U. oweni*, *U. arizonicus*, and "a series of similar species from the Americas."

Diagnosis. Philoponella males are distinguished by having: 1. an oval carapace with a broad, transverse thoracic groove (Figs. 205, 217), 2. a nearly straight posterior eye row with about equally spaced eyes, 3. a clypeus height 0.6 to 1.5 an AME diameter, 4. a well-developed conductor spur (Plate 7-B), and 5. a first tarsus with four to five prolateral, four to five retrolateral, and six to eight dorsal macrosetae. Females are characterized by having: 1. a nearly straight posterior eye row with about equally spaced eyes (Figs. 204, 216), and 2. a ventral epigynal atrium whose posterior margin is formed by two lateral lobes (Figs. 208, 239, 250, 287).

Description. Carapace width 0.9 to 1.0 mm long. At ALEs cephalic region of females gradually narrowed to about half maximum carapace width; that of all males except those of *P. tingena* less conspicuously narrowed, making their carapace oval (Figs. 205, 217). Cephalic region rises slightly from a narrow transverse or semicircular thoracic groove to the ocular area. The AMEs on a low anteriorly directed mound, more prominent in males than in females. Eyes in two recurved rows, posterior row only slightly curved so that a line across PMEs' posterior margins passes through or posterior to the PLEs' centers (Fig. 204). Median ocular area is either square or 0.8 as wide anteriorly as posteriorly. The AME-ALE separation two to three times AME separation and PME-PLE separation 0.6 to 1.0 times PME separation. Clypeus height in anterior view 0.7 to 1.5 times an AME diameter. Sternum width 0.67 length. Endites 1.3 and labium 1.1 times

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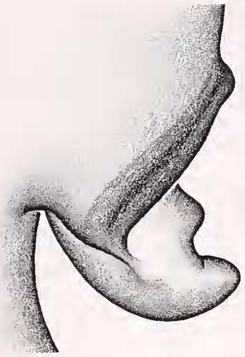
Figures 207–215. *Philoponella republicana* (Simon). 207. Lateral view of epigynum. 208. Ventral view of epigynum. 209. Posterior view of epigynum. 210. Dorsal view of cleared epigynum. 211. Dorsal view of female first femur. 212. Retrolateral view of left embolus (black), sperm reservoir, and fundus. 213. Ventral view of male, left palpal femur. 214. Retrolateral view of male left palpus. 215. Retrolateral view of expanded male left palpus. Figures 216–219. *Philoponella divisa* n. sp. 216. Dorsal view of female. 217. Dorsal view of male. 218. Retrolateral view of male left palpus. 219. Apical view of male left palpus.



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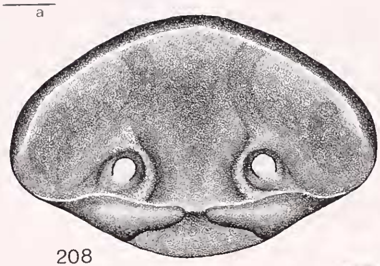

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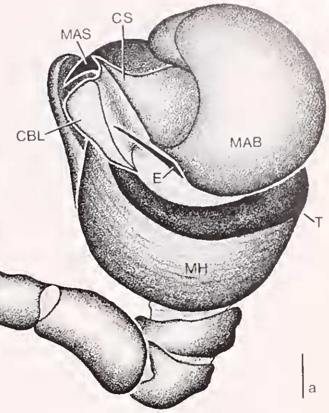

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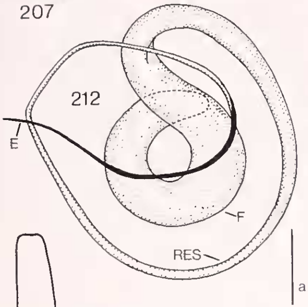

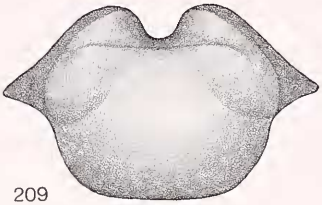

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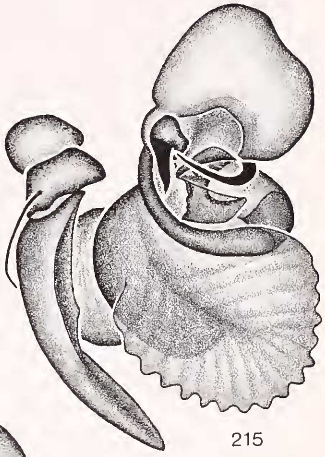

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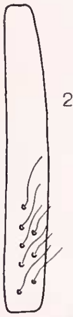

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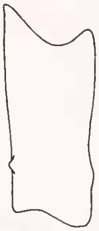

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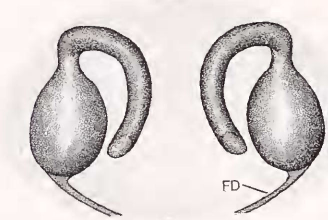

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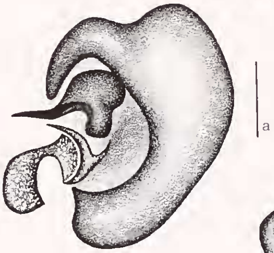

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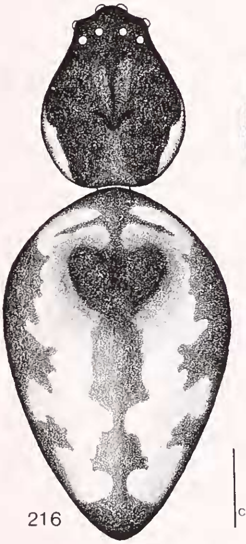

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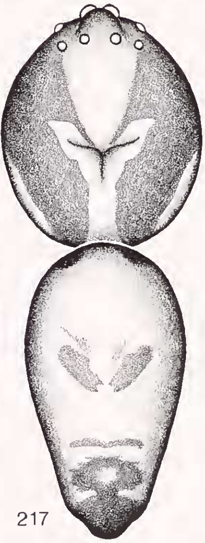

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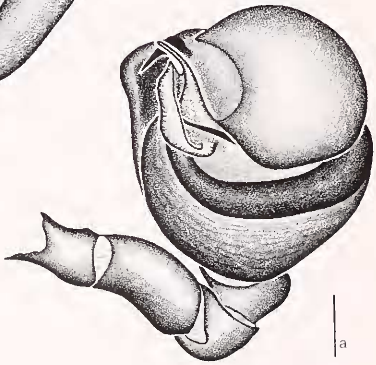

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as long as wide. Female palpal femur not flattened, calamistrum half as long as fourth metatarsus. Male first femur with three prolateral, one or two retrolateral, and one or two dorsal macrosetae. Male first tibia with four or five prolateral, four or five retrolateral, and six or eight dorsal macrosetae. Abdomen width and height one-third to one-half its length. In females it attains its maximum width about midway along its length and in males in the anterior third of its length. Abdomen height usually attained at or slightly anterior to widest area. Fine tracheoles which arise from two stout tracheal trunks are restricted to the abdomen (Fig. 1).

Male Palpus. Femur's ventral surface with one or two small, proximal tubercles (Figs. 213, 269). Tarsus with two long, apical cymbial setae and a large middle hematodocha (Plate 7-B). A grooved conductor blade arises near the proximal, ventral border of the median apophysis bulb and continues as a narrow, heavily sclerotized conductor spike into the proximity of the median apophysis spur. Proximal conductor lobe may be nearly square, weakly sclerotized, and often difficult to see as in the *republicana* group (Figs. 214, 215; Plate 7-B) or it may be longer than broad, heavily sclerotized, and conspicuous as in the *vittata* (Fig. 270) and *semiplumosa* (Fig. 253) groups.

Epigynum. Females are characterized by a well sclerotized epigynum with a large, deep, central atrium (Figs. 208, 239, 250, 287) bordered by precipitous anterior (except in *P. vittata*, Fig. 266) and posterior rims. Posterior rim bears an epigynal opening at each anterior lateral margin and may be continuous (Figs. 250, 275, 287) or comprised of two distinct lobes joined medially (Figs. 208, 239). Openings may be at the atrium's center (Fig. 250) or in the atrium's posterior half (Figs. 208, 230, 266) and are separated by a distance of half (Fig. 208) to 0.8 (Fig. 250) the epigynum's width. Anterior and posterior rims may be contiguous (Figs. 250, 259, 275) or separated laterally by wide troughs (Figs. 208, 221, 239). Epigynal ducts make one or two loose 180° loops (Figs. 223, 268) or spiral tightly around themselves (Figs. 252, 277) before connecting to a pair of spermathecae from whose posterior margins fertilization ducts lead. The *republicana* species group appears more primitive than the *semiplumosa* group. In *semiplumosa* females there is more extensive coiling and spiraling of ducts (Fig. 252), more complete median fusion and anterolateral displacement of epigynal openings and closure of lateral epigynal troughs. Members of the *fasciata* species group have coiled epigynal ducts (Fig. 277) and closed epigynal troughs (Figs. 275, 287) indicating they are intermediate between the two other species groups.

Natural History and Distribution. Members of many species in this genus are found in colonies consisting of numerous orb-webs built in a common, irregular framework. Some webs are associated with those of spiders belonging to other families (see family Natural History section). In the New World, members of this genus are found from the extreme southern central United States southward as well as in the West Indies (Maps 3–5). The genus is also represented in Oriental and Australian regions.

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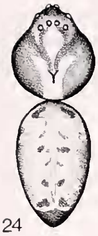
Figures 220–223. *Philoponella divisa* n. sp. 220. Lateral view of epigynum. 221. Ventral view of epigynum. 222. Posterior view of epigynum. 223. Dorsal view of cleared epigynum. Figures 224–232. *Philoponella tingena* (Chamberlin and Ivie). 224. Dorsal view of male. 225–227. Dorsal view of female. 228. Lateral view of female carapace. 229. Lateral view of epigynum. 230. Ventral view of epigynum. 231. Posterior view of epigynum. 232. Retrolateral view of left male palpus. 233. Eggsac. Figure 234. *Philoponella signatella* (Roewer), dorsal view of female.



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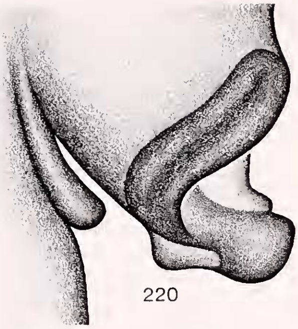

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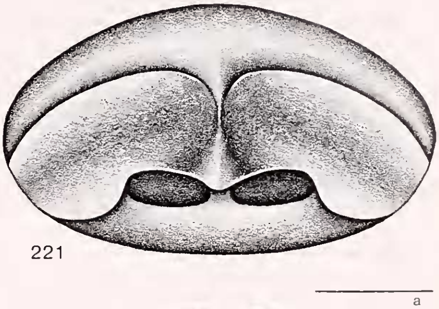

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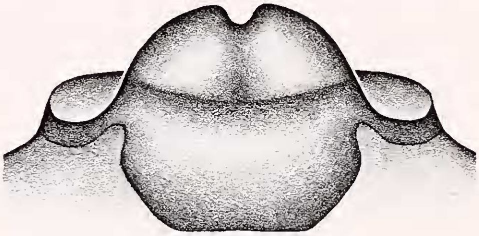

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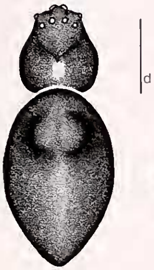

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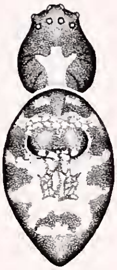

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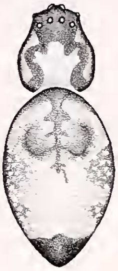

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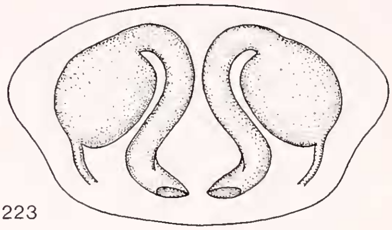

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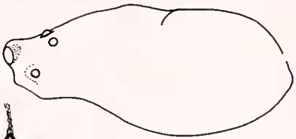

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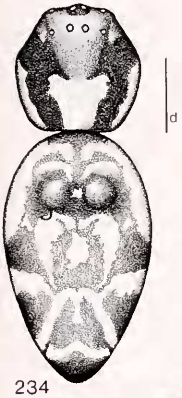

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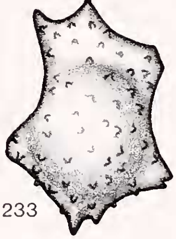

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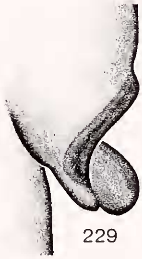

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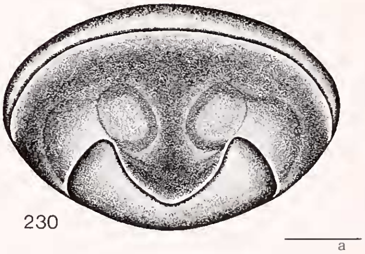

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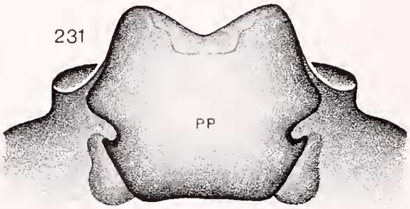

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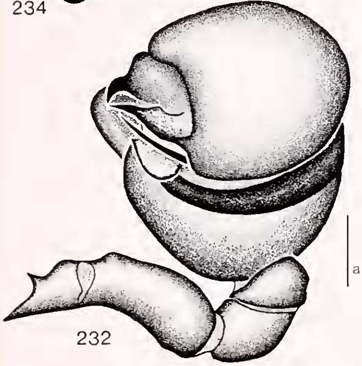

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KEY TO *PHILOPONELLA* FEMALES

1. Clypeus height 0.5 to 0.7 AME diameter; anterior rim of epigynal atrium broad, rounded, and not precipitous (Fig. 266); epigynal openings in posterior sixth of atrium; South America (Map 5) ____ *vittata*

– Clypeus height equal to AME diameter; anterior rim of atrium precipitous and usually narrow (Figs. 208, 239, 250, 275); epigynal openings in anterior half (Figs. 242, 250, 287) to posterior third (Figs. 208, 239) of atrium or, if more posterior, posterior rim projects conspicuously ventrally and has a length equal to that of the anterior rim (Figs. 284, 286) ______________ 2

2(1). Epigynal openings separated by half or less the atrium's width (Figs. 208, 230, 242); precipitous anterior and posterior rims separated by conspicuous lateral or posterolateral troughs (Figs. 208, 221, 239); posterior rim of epigynum 0.4 to 0.6 the epigynum's width and composed of two lateral lobes separated by a median depression or notch (Figs. 209, 222, 231, 240); (*republicana* species group)________ 3

– Epigynal openings separated by at least three-fourths atrial width (Figs. 250, 259, 275, 287), or if less, posterior epigynal plate as high as wide (Figs. 284, 286); anterior and posterior rims not separated by wide, lateral troughs (Figs. 250, 259, 275); posterior rim at least three-fourths as wide as epigynal atrium and without a deep median indentation or notch (Figs. 250, 251, 275, 276, 287, 288) ______ 7

3(2). Epigynal atrium with a thin, median, longitudinal septum (Fig. 221); posterior margin with a shallow notch separating lobes (Fig. 222); epigynum's posterior face with a middle ridge (Figs. 220, 222); abdominal dorsum with two broad, light paraxial stripes (Fig. 216); Colombia ____ ____ *divisa*

– Epigynal atrium without a septum (Figs. 208, 239); posterior margin with a deep notch (Figs. 209, 240) or a broad depression separating lobes (Fig. 231); epigynum's posterior face without a ventral rim (Figs. 207, 209, 229, 231, 238, 240); abdominal coloration otherwise (Figs. 204, 226, 234) ________________________________ 4

4(3). Epigynal atrium shallow with broad, laterally directed troughs (Figs. 208, 242); anterior rim and posterior lobes separated by a distance equal to half the atrial width (Figs. 208, 242); epigynal openings visible in ventral view (Fig. 208, 242) __ 5

– Epigynal atrium deep with posteriorly-directed troughs (Figs. 230, 239); anterior rim and posterior lobes separated by a distance equal to 0.30 the atrial width (Figs. 230, 239); epigynal openings located at the anterior margins of the posterior lobes and hidden in ventral view (Figs. 230, 239) __________________________________ 6

5(4). Epigynal openings on raised mounds in posterior third of atrium (Figs. 207, 208); total body length more than 5.4 mm; sternum usually dark gray and more than 1.1 mm long; abdominal dorsum with two pairs of light, lateral, longitudinal, diverging white stripes (Fig. 204); Panama and South America (Map 3) __ *republicana*

– Epigynal openings in depressions at atrium's center (Fig. 242); total body length less than 4.2 mm; sternum tan with gray posterolateral margins and less than 0.8 mm long; abdominal dorsum with a broad, light median stripe (Fig. 241); southern Mexico______________ *vicina*

6(4). Posterior epigynal lobes widely separated by a shallow depression (Fig. 231); anterior epigynal rim one-fifth as long as atrium (Fig. 230); total body length less than 4.0 mm; sternum less than 0.8 mm long; Costa Rica, Panama, and Colombia (Map 3). __________________________ *tingena*

– Posterior epigynal lobes closely spaced and separated by a deep notch (Fig. 240); anterior epigynal rim half to a third the atrial length (Fig. 239); total body length more than 4.0 mm; sternum length more than 0.9 mm; Honduras through eastern Mexico (Map 3)________________ *signatella*

7(2). Epigynal atrium slightly longer than wide (Fig. 287); epigynal openings in anterior half of atrium (Fig. 287); posterior face of epigynum with two lateral grooves (Fig. 288); northeastern Colombia __ *bella*

– Epigynal atrium about twice as wide as long (Figs. 250, 259, 275, 284); epigynal openings at center of atrium (Figs. 250, 275) or in posterior half (Figs. 259, 284); posterior face of epigynum without lateral grooves (Figs. 251, 262, 276, 286) 8

8(7). Posterior face of epigynum as high as broad (Fig. 286); epigynal openings in the posterior quarter of atrium (Fig. 284); venter of abdomen usually with a dark W mark on a light field (Fig. 282); Paraguay ____________________________________ *para*

– Posterior face of epigynum about twice as wide as high; epigynal openings at or slightly behind the atrium's center; venter of abdomen gray with light paraxial stripes__________________________________ 9

9(8). Anterior atrial rim continues to the epigynum's posterior margin and encloses the broad, dorsally sloping lateral regions of the posterior rim (Fig. 275); large, longitudinal epigynal openings separated by a distance equal to 0.6 the atrial width; Paraguay and southeastern Brazil (Map 5) ____________________________________ *fasciata*

– Anterior and posterior atrial rims end abruptly upon meeting at or slightly posterior to the atrium's center (Figs. 250, 257, 259); small, transverse epigynal openings are separated by a distance equal to 0.8 the atrial width; southwestern United States through Central America and the West Indies (Map 4); (*semiplumosa* species group) 10

10(9). Abdominal venter gray with two narrow, paraxial white stripes (Fig. 249) setose field anterior to cribellum smaller than cribellum; lengths of anterior and posterior epigynal rims equal (Fig. 250); ducts of most specimens do not show through atrial integument; total length less than 4.5 mm, sternum length less than 1.0 mm, southeastern Texas through Central America and the West Indies (Map 4) .... *semiplumosa*

– Abdominal venter with two broad white stripes (Fig. 256); setose field equal to or larger than cribellum; anterior epigynal rim one quarter the length of the posterior rim (Figs. 257, 259); ducts of most specimens visible through atrial integument; total length greater than 4.6 mm, sternum length more than 1.0 mm 11

11(10). Epigynal atrium less than 0.5 mm wide and 0.4 as long as wide (Fig. 257); epigynum in posterior view without ventrolateral gray lines; most specimens darkly colored (Fig. 255); carapace less than 2.0 mm long; sternum less than 1.4 mm long; southwestern United States and northern Mexico (Map 4) .... *oweni*

– Epigynal atrium more than 0.6 mm wide and 0.6 as long as wide (Fig. 259); posterior face of epigynum with dark lines (Fig. 262); most specimens with no dark color markings (Fig. 260); carapace more than 2.3 mm long, sternum more than 1.5 mm long; Arizona (Map 4) .... *arizonica*

KEY TO *PHILOPONELLA* MALES

(Males of *P. vicina* and *P. bella* are unknown.)

1. Carapace high and cylindrical (Figs. 278, 279), transverse thoracic groove deep (Fig. 278), clypeus height twice AME diameter; palpal femur with a retrolateral tubercle whose length is three times its basal width (Fig. 281); median apophysis very small and flat (Fig. 208); Paraguay and southern Brazil (Map 5) .... *fasciata*

– Carapace low with rounded margins; thoracic groove usually not deep (Figs. 205, 217); clypeus height equal to AME diameter; palpal femur's retrolateral tubercle, if present with a length equal to or less than its basal width (Fig. 269); median apophysis bulb not so reduced (Figs. 214, 235, 253, 270) 2

2(1). Conductor's proximal lobe at least three times as long as broad and easily seen although thin (Figs. 253, 270), at least 1.5 times as long as either the conductor spike or median apophysis spur's apical projection; median apophysis spur's apical (darkest) projection more robust, its length equal to or less than twice its basal width (Fig. 245); median apophysis spur's basal region surrounded by bulb along half of its perimeter (Fig. 245) 3

– Conductor's proximal lobe small, square, and usually difficult to see (Figs. 214, 215, 218, 232, 236), no longer than the conductor spike or median apophysis spur's apical projection (or conductor lobe short and with a long, thin, apical projection running parallel to the conductor spur, Fig. 283); median apophysis spur's apical (darkest) projection long and slender, about three times as long as its basal width (Figs. 203, 272); median apophysis spur's basal region surrounded by bulb along one quarter or less of its perimeter (Figs. 203, 272) 6

3(2). Conductor lobe large (Fig. 270); median apophysis bulb dome-shaped (Figs. 270, 271); dorsum of abdomen with three light chevrons (Fig. 265), venter with a light chevron midway between spinnerets and epigastric furrow; South America (Map 5) .... *vittata*

– Conductor lobe small (Fig. 253); bulb flattened (Fig. 253); abdomen not so marked (Figs. 248, 258, 261); southwestern United States through Central America and West Indies 4

4(3). First tibia with eight or fewer dorsal macrosetae; carapace less than 1.4 mm long, sternum less than 0.8 mm long; southeastern Texas through Central America and West Indies (Map 4) .... *semiplumosa*

– First tibia with nine to 12 dorsal macrosetae; carapace more than 1.6 mm long, sternum more than 0.9 mm long; southwestern United States and northwestern Mexico 5

5(4). Sternum dark; usually nine or ten dorsal spines on first tibia; carapace less than 1.8 mm long, sternum less than 1.1 mm long; palpal median apophysis bulb less than 0.6 mm wide; median apophysis spur's apical (darkest) projection 1.5 times as long as its basal width (Fig. 245); Map 4 .... *oweni*

– Sternum light; usually 12 dorsal spines on first tibia; carapace more than 2.0 mm long, sternum more than 1.1 mm long; palpal median apophysis bulb more than 0.6 mm wide; median apophysis spur's apical (darkest) projection two times as long as its basal width (Fig. 245); Map 4 .... *arizonica*

6(2). Conductor lobe with a long, slender apical projection which extends parallel to and is about as long as the conductor spike (Fig. 283); median apophysis bulb with a small, apical lobe (Fig. 283); median apophysis spur's basal region with a long distal lobe (Fig. 272); first tibia with four dorsal macrosetae; Paraguay .... *para*

– Conductor lobe square, without an apical projection (Plate 7-B; Figs. 214, 215, 218); median apophysis bulb without an apical lobe (Figs. 214, 218, 232, 235); spur's basal region without such a lobe (Fig. 203); first tibia with six to eight dorsal macrosetae (*republicana* species group, in part) 7

7(6). In apical view median apophysis bulb with a lobe which extends along the median surface of the median apophysis spur's basal region (Fig. 203); sternum usually dark gray 8

– Median apophysis bulb without such a lobe (Fig. 203); sternum tan to reddish brown with gray posterolateral margins 9

8(7). Total length more than 3.6 mm, sternum length more than 0.9 mm; median apophysis bulb diameter 0.4 mm; Panama and South America (Map 3) .... *republicana*

– Total length less than 3.4 mm, sternum length less than 0.9 mm; median apophysis bulb diameter 0.3 mm; Colombia (Map 3) .... *divisa*

9(7). Carapace more than 1.2 mm long, sternum more than 0.7 mm long; median apophysis bulb rounded-rectangular (Fig. 235), diameter 0.4 to 0.5 mm; carapace light tan with two anteriorly diverging longitudinal gray stripes (Fig. 237); eastern Mexico through Honduras (Map 3) .... *signatella*

– Carapace less than 1.2 mm long, sternum less than 0.7 mm long; median apophysis bulb semicircular (Fig. 232), diameter 0.2 to 0.3 mm; carapace gray with either no color markings or with a wide median light longitudinal stripe (Fig. 224); Costa Rica through Colombia (Map 3) .... *tingena*

The *Philoponella republicana* Species Group

This group contains *P. republicana*, *P. divisa*, *P. tingena*, *P. signatella*, and *P. vicina*. It does not correspond to the *Uloborus republicana* species group of Muma and Gertsch (1964) which is a synonym of the genus *Philoponella*.

Description. Clypeus height of males and females equal to AME diameter. Epigynal openings in posterior third (Fig. 230) to half (Fig. 208) of epigynal atrium and seaparated by a distance equal to half the atrium's width. Anterior and posterior atrial rims widely separated, forming broad lateral or posterolateral troughs (Figs. 208, 221, 239). Anterior rims precipitous and posterior rim composed of two lateral lobes separated by a depression or notch (Figs. 208, 209, 239, 240). Each female connecting duct makes a single loop before connecting with a spermatheca (Fig. 210). In *P. vicina* each duct connects to a small bulb which, in turn, connects with a spermatheca (Fig. 244). Conductor blade of male palpus short and square, about as high as long (Plate 7-B; Figs. 215, 218). Conductor spike shorter than slender median apophysis spur's apical projection (Figs. 232, 235, 236). Prolateral palpal femoral tubercle slightly larger than retrolateral tubercle and with a length slightly less than its basal width (Fig. 213).

Philoponella republicana (Simon), new combination

Plate 7-B; Table 4; Figures 1, 203–215; Map 3

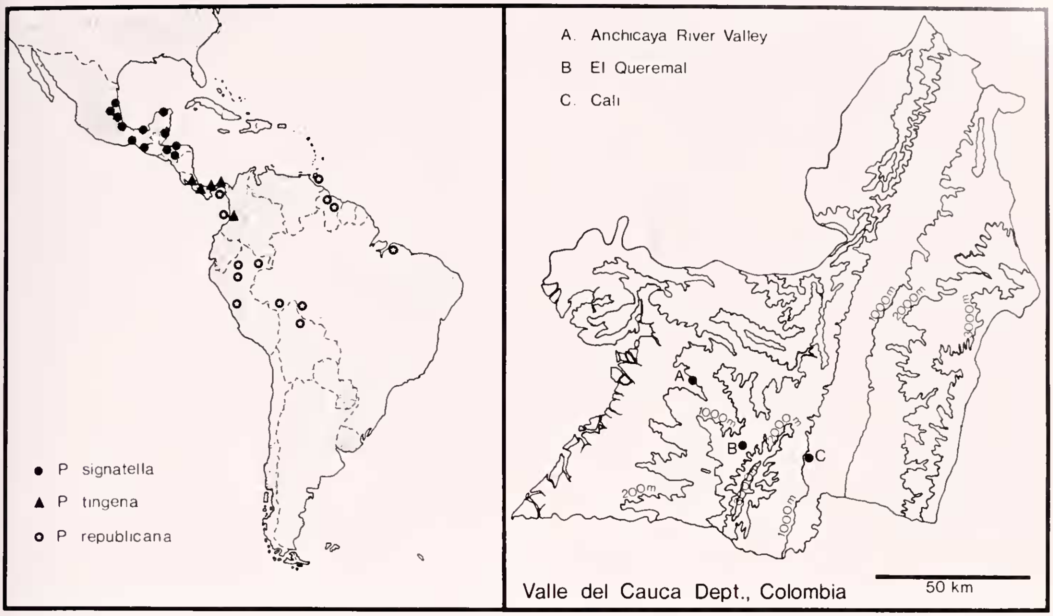
Uloborus republicanus Simon, 1891, Ann. Soc. ent. France, 60: 8. Five male and 56 female syntypes from the forests of San Esteban (6 km S of Puerto Cabello), Venezuela, collected by E. Simon on 29 February to 27 March 1888, in Muséum National d'Histoire Naturelle, Paris, examined. Bonnet, 1957, Bibliographia Araneorum, 2: 4768.

Uloborus cuminamensis Mello-Leitão, 1930, Sep. Arch. Mus. Nac., Rio de Janeiro, 32: 61. Female holotype (No. 1216) from Cuminá [Cuminapanema] River in the Brazilian state of Pará, in Museu Nacional, Rio de Janeiro, Brazil, examined, NEW SYNONYMY.

Uloborus mundior Chamberlin and Ivie, 1936, Bull. Univ. Utah, 27(5): 11. Female holotype, three male and ten female paratypes from Barro Colorado Island, Panama, collected by A. M. Chickering in 1928, in the American Museum of Natural History, examined, NEW SYNONYMY.

Zosis mundior:—Lehtinen, 1967, Ann. Zool. Fennici, 4: 277.

Note. Included with *U. republicanus*



Map 3. Distribution of *Philoponella signatella*, *P. tingena*, and *P. republicana* (left) and Colombian *P. tingena* (right).

syntypes were four male and two female *Philoponella servula* (=*P. vittata*). Simon clearly separated these two species in 1892 [1893]. As he collected both species at San Esteban during the same time period it is likely that these *P. servula* represent specimens he overlooked when sorting his collection. A female *Leucauge* and male *Nephila* were also included with the syntypes.

Diagnosis. Philoponella republicana females are distinguished by having a long, shallow, undivided epigynal atrium whose openings are situated on raised mounds and easily visible in ventral view (Fig. 208). Posterior lobes are low and wider than long (Figs. 208, 209). Females have a characteristic abdominal color pattern featuring two pairs of diverging white stripes (Fig. 204). Males are distinguished from all others of this species group but *P. divisa* by the presence of a median apophysis lobe which, in apical view, extends along the median surface of the median apophysis spur's basal region (Fig. 203). *Philoponella republicana* is larger than *P. divisa*, having a total length of more than 3.6 mm and a sternum length of more than 0.9 mm.

Description. Female. Total length 5.5 to 7.6 mm ($\bar{X}$ = 6.35, SD = 0.47, N = 40), carapace length 1.7 to 2.3 mm ($\bar{X}$ = 1.96, SD = 0.12), sternum length 1.1 to 1.4 mm ($\bar{X}$ = 1.26, SD = 0.08). Abdomen half as wide as long with a single broad, raised area in anterior fourth (Fig. 204). Dark forms with only faint light carapace and abdominal markings (Fig. 204). Lighter forms with light, trilobed carapace marking whose central lobe extends to front of carapace. Sternum black. Dorsum of abdomen with two or three recurved, nearly paraxial white chevrons; tip dark gray. Venter of abdomen with dark gray median area. Legs reddish brown or light gray with central light ring on femora and tibiae. Epigynal atrium open laterally, about half as long as wide (Fig. 208). Each opening on a raised area and easily visible in ventral view (Figs. 207, 209). Anterior epigynal rim about one-tenth as long as atrium. Ducts at their closest point separated by two diameters (Fig. 210).

Male. Total length 3.6 to 4.6 mm ($\bar{X}$ = 4.10, SD = 0.18, N = 40), carapace length 1.6 to 1.9 mm ($\bar{X}$ = 1.72, SD = 0.08), sternum length 0.9 to 1.1 mm ($\bar{X}$ = 0.98, SD = 0.04). Carapace light reddish brown dusted with gray (Fig. 205). Median light area in the shape of a posteriorly directed arrowhead extending full length of carapace. Sternum dark gray. Dorsum of abdomen tan, white pigment spots forming three fairly distinct chevrons, tip dark gray (Fig. 205). Venter of abdomen with median dark gray area about half as wide as abdomen. Legs light reddish brown. The palpal median apophysis bulb has a width of about 0.4 mm ($\bar{X}$ = 0.38, SD = 0.02, N = 40) and is crescent to semicircular shaped (Figs. 214, 215).

Natural History and Distribution. Found in Panama and South America (Map 3). The presocial nature of this species has been known since Simon's (1891) description and illustration of *P. republicana* from Venezuela (see family Natural History).

Philoponella divisa n. sp.

Plate 8-A–C; Table 5; Figures 216–223; Map 3

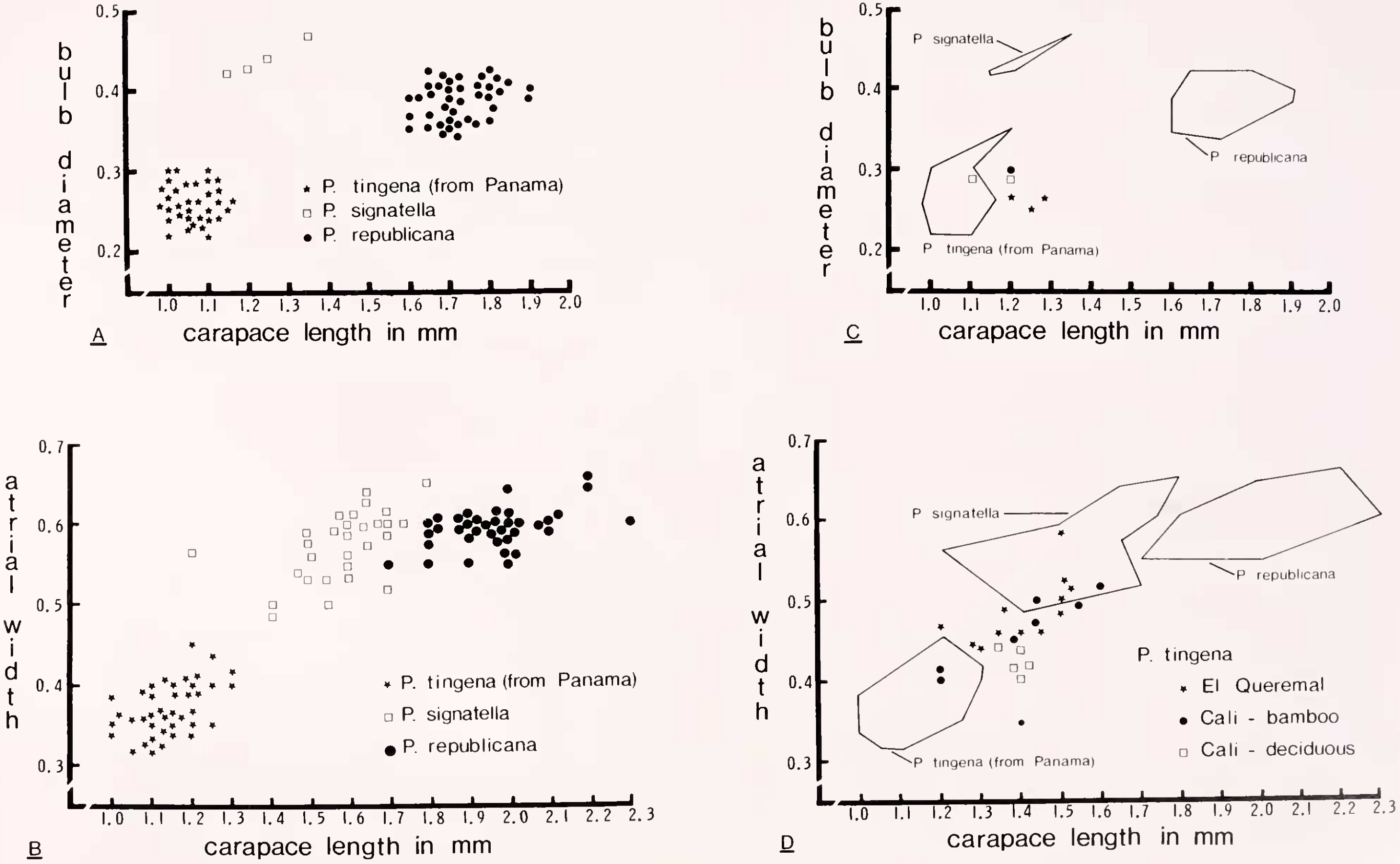
Types. Female holotype, one male and two female paratypes in the Museum of Comparative Zoology, one male and one female paratype in the American Museum of Natural History. All specimens from the Anchicayá River Valley near the Central de Anchicayá Limitada, Planta Hidraulica in the Colombian department of Valle del Cauca, collected 7 to 9 August by B. Opell. The specific epithet refers to the lateral division of the epigynal atrium.

Diagnosis. Females are distinguished by their divided epigynal atrium (Fig. 221) and dorsal abdominal coloration (Fig. 216). Males are distinguished from all others of this species group but *P. republicana* by the presence of a large median apophysis lobe which, in apical view, extends along the median surface of the median apophysis spur's basal region (Fig. 203). *Philoponella divisa* males are smaller than those of *P. republicana*, having a total length of 3.4 mm or less and a sternum length of 0.9 mm or less.

Description. Female. Total length 3.0 to 3.6 mm ($\bar{X}$ = 3.35, SD = 0.23, N = 9), carapace length 1.0 to 1.1 mm ($\bar{X}$ = 1.04, SD = 0.04), sternum length 0.7 to 0.8 mm ($\bar{X}$ = 0.72, SD = 0.04). Abdomen width and height about 0.6 its length with two dorsal humps in the anterior third of its length. Most specimens have a dark gray carapace with light posterolateral margins and a few have a light posteromedian longitudinal stripe (Fig. 216). Sternum dark gray to black. Abdomen dark gray to black with a pair of broad, light paraxial stripes on dorsum (Fig. 216) and venter. First femur dark gray with a narrow white ring in distal half of its length. Second through fourth femora gray with a white ring in proximal third and distal two-thirds of its length. Patellae dark gray. Tibiae gray with proximal and central white rings. Metatarsi and tarsi gray with narrow proximal white rings. In ventral view epigynal crypt about 0.2 as long as wide, divided by a thin median septum, and with low, closely spaced posteromedian lobes (Figs. 221). In posterior view raised posterior epigynal face with two lateral posterior lobes separated by a shallow notch (Fig. 222). A simple straight duct leads from each inconspicuous posteromedian epigynal opening to a spherical spermatheca (Fig. 223).

Male. Total length 2.6 to 3.4 mm ($\bar{X}$ = 3.02, SD = 0.22, N = 8), carapace length 1.3 to 1.4 mm ($\bar{X}$ = 1.38, SD = 0.35), sternum length 0.7 to 0.8 mm ($\bar{X}$ = 0.78, SD = 0.04). Carapace gray with a light median stripe and light posterolateral margins (Fig. 217). Abdomen tan with one or two mid dorsal paraxial spots and a gray posterior tip (Fig. 217). Legs white to tan, markings when present, of low contrast. First and second femora light gray with a narrow white ring in distal half of its length. Second through third femora tan. First, third, and fourth patellae tan, second patella light gray. First, second and fourth tibiae light gray with a narrow, central, white ring. Third tibia tan with

TABLE 4. ANALYSIS OF THE SPECIES IN THE *PHILOPONELLA REPUBLICANA* SPECIES GROUP: A. COMPARISON OF MALES. B. COMPARISON OF FEMALES, C. EVALUATION OF *P. TINGENA* MALES FROM THREE COLOMBIAN POPULATIONS (SEE D FOR KEY TO SYMBOLS), D. EVALUATION OF *P. TINGENA* FEMALES FROM THREE COLOMBIAN POPULATIONS.



a distal gray band. Metatarsi and tarsi tan. Median apophysis bulb semicircular (Fig. 218), length and width about 0.3 mm ($\bar{X}$ = 0.29 mm, SD = 0.01, N = 8).

Natural History and Distribution. Known only from the type locality in Colombia (Map 3). Specimens were collected from vegetation and rocks of roadside banks where their webs were always found adjacent to and connected with diplurid funnel webs. Several *P. divisa* webs were usually found together, but colonies did not exceed four individuals. Webs of immatures and mature females were diagonal to vertical (Plate 8-A–C; Table 5) and featured a signal line running from the hub to a peripheral support. The spider hung from this line near the support and moved to the hub only when prey vibrations were detected. As with other *Philoponella* species, males were observed hanging from framework threads of female and immature orb-webs.

Philoponella tingena (Chamberlin and Ivie), new combination

Plate 8-E–F; Tables 4, 5; Figures 224–232; Map 3

Uloborus tingens Chamberlin and Ivie, 1936, Bull. Univ. Utah, 27(5): 10. Female holotype and six female paratypes from Barro Colorado Island, Panama, Canal Zone, collected by A. M. Chickering in 1928, in the American Museum of Natural History, examined.

Diagnosis. Philoponella tingena and *P. signatella* are similar. Females of the former have a broad, shallow depression separating posterior epigynal lobes (Figs. 230, 231); whereas the latter has a deep notch separating lobes (Figs. 239, 240). *Philoponella tingena* males are smaller than *P. signatella* males, having a carapace length of less than 1.2 mm and a sternum length of 0.6 mm. Other features distinguishing these two species are found in *P. signatella* diagnosis.

Description. Female. Total length 2.8 to 4.0 mm ($\bar{X}$ = 3.45, SD = 0.30, N = 40), carapace length 1.0 to 1.3 mm ($\bar{X}$ = 1.14, SD = 0.08), sternum length 0.6 to 0.8 mm ($\bar{X}$ = 0.74, SD = 0.06). Abdomen two-thirds as wide as long with two distinct tubercles in anterior third. Some specimens entirely black with light gray rings in center of femora and tibiae of legs. Lighter species have a dark gray carapace with a wide, median, posterior, trilobed white area extending forward 0.6 the carapace length (Figs. 226, 227). The three lobes are of nearly equal length. Sternum light reddish brown with gray posterior lateral margins. Abdominal dorsum with three white chevrons or with closely spaced white pigment spots (Fig. 226, 227). Posterior tip gray. Abdominal venter with median light gray area. Legs tan or with color markings as in darker specimens. Epigynal atrium bordered posteriorly by two lobes which are widely separated by a shallow depression (Figs. 230, 231). Atrium open posterolaterally. Distance from posterior lobes to the anterior rim one-third epigynum's width and five times length of anterior rim. In ventral view epigynal openings usually hidden (Fig. 230), but sometimes visible just anterior and medial to posterior lobes. At their closest point ducts are separated by a distance of one diameter.

Male. Total length 2.2 to 2.8 mm ($\bar{X}$ = 2.50, SD = 0.13, N = 40), carapace length 1.0 to 1.2 mm ($\bar{X}$ = 1.06, SD = 0.05), sternum length 0.6 mm ($\bar{X}$ = 0.60, SD = 0.02). Carapace light tan often with light gray sides (Fig. 224). Sternum light tan. Dorsum of abdomen light tan with gray posterior tip and a few scattered white pigment spots (Fig. 224). Venter light tan or with a very faint gray median area. Legs light tan with a distal gray ring around tibiae and metatarsi of some or all legs. Semicircular median apophysis palpal bulb with an average diameter of 0.2 to 0.3 mm ($\bar{X}$ = 0.26, SD = 0.02, N = 40) (Fig. 232).

Species Variability. In Panama and Colombia *P. tingena* is sympatric with *P. republicana* (Map 3). In the Colombian

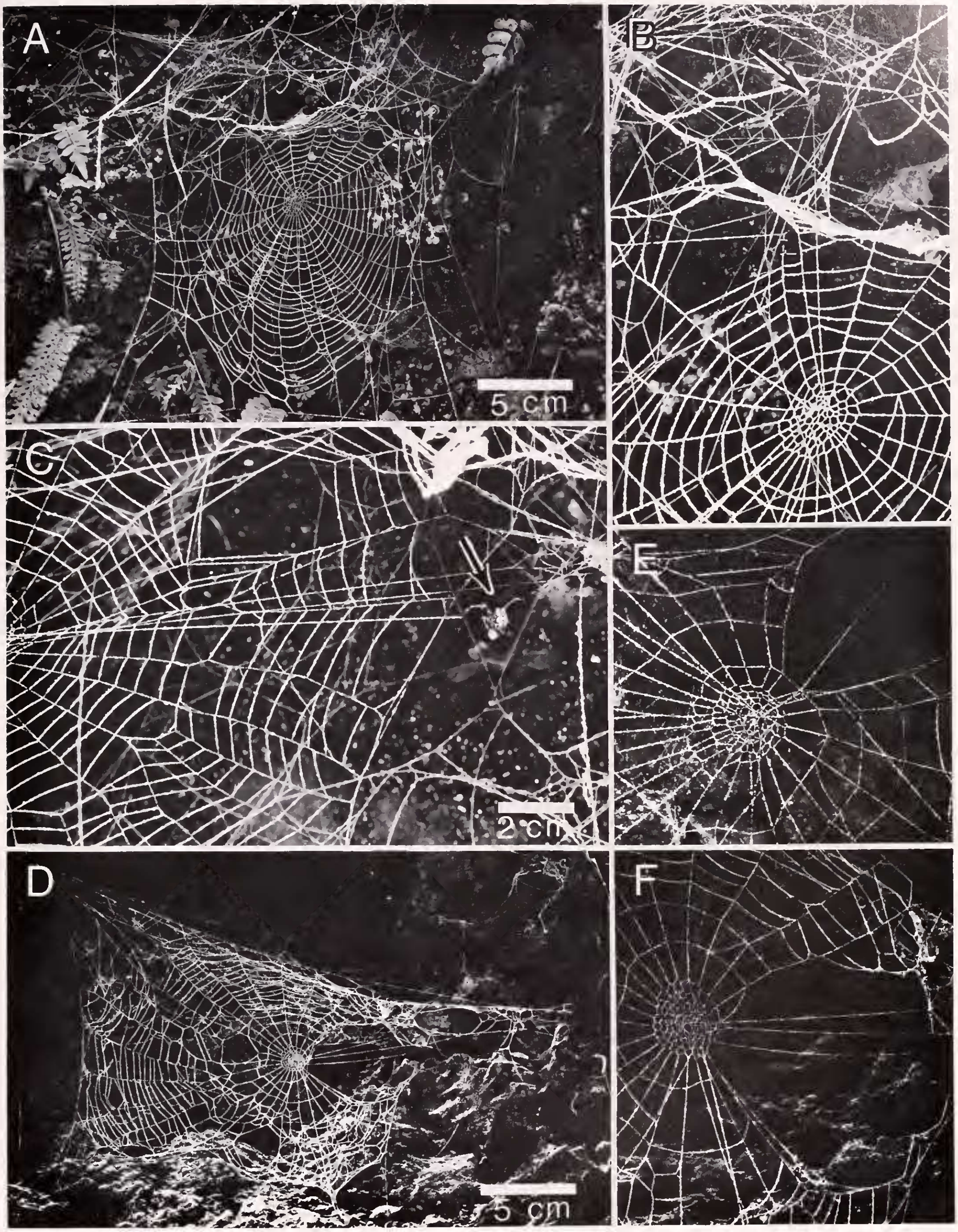


Plate 8. A. Web of *Philoponella divisa* female holotype. B. *Philoponella divisa* female holotype (arrow) hanging from a signal line at the orb's perimeter. C. *Philoponella divisa* female (arrow) feeding while hanging from a signal line at the orb's perimeter. D. Web of *Philoponella tingena* from El Queremal, Colombia (Map 3) with three signal lines extending through a vacant web sector (F). E. *Philoponella tingena* web from El Queremal, Colombia (Map 3) with a single signal line. F. Close-up of triple signal lines of web shown in D.

department of Valle del Cauca three local populations of *Philoponella* having individuals morphologically indistinct from, but larger than Panamanian *P. tingena* were studied: one from the faces of large boulders and roadside banks at El Queremal (1600 m), one from a bamboo forest south of Cali (1000 m), and one from a lowland deciduous forest near Cali (1000 m). The latter was found in colonies among buttress tree roots and its individuals produced a nearly horizontal, complete orb-web and rested at the web's hub while waiting for prey. Individuals of the former two populations were less often gregarious and the few colonies observed were small. Members of these two populations constructed diagonal or vertical webs with a vacant sector through which one to three signal lines ran (Plate 8-D–F) and rested at the attachment of the signal line(s) to a peripheral support. An insufficient web sample was obtained to permit detailed analysis of the deciduous forest population, but the webs of bamboo forest (*P. tingena* Cb) and El Queremal (*P. tingena* B) populations do not significantly differ (Table 5). Specimens from the bamboo forest are light tan to white in color with very few dark markings; whereas, those from the other two populations are predominantly dark gray to black. Additionally, the average egg diameter (for each species ten eggs from each of three eggsacs were measured, SD for each species = 0.02 mm) for Panamanian *P. tingena* was 0.53 mm and for the El Queremal populations 0.70 mm. Although this evidence suggests that two or perhaps all of these populations may be sibling species of *P. tingena*, additional study is required before this can be determined. Previous evidence can be challenged by arguments that: 1. color differences between populations are no greater than those found within some *Philoponella* species, 2. careful study of intraspecific web variability is needed to show that web structure is not influenced by environmental and predatory pressures, 3. size differences do not clearly separated the populations from one another (Table 4-C, D) and the trend for Colombian specimens to be larger than Panamanian specimens may represent clinal variation, altitudinal influence, or character displacement, and 4. data have been obtained from only restricted localities.

Distribution. Costa Rica, Panama, and Colombia (Map 3).

Philoponella signatella (Roewer), new combination

Table 4; Figures 234–240; Map 3

Uloborus signatus O. Pickard-Cambridge, 1898, Biol. Cent.-Amer., Arachnida-Araneida, 1: 264. One male and one female syntype from Teapa in the Mexican state of Tabasco, collected by H. H. Smith, in the British Museum (Natural History), examined.

Uloborus signatellus Roewer, 1951, Abh. Naturw. Ver. Bremen, 32(2): 1344. New name for *Uloborus signatus* O. Pickard-Cambridge, 1898, *op. cit.*, preoccupied by *Uloborus signatus* O. Pickard-Cambridge, 1876, Proc. Zool. Soc. Lond., 1876: 579 [=*U. plumipes* Lucas, 1846].

Diagnosis. Along with *P. tingena, P. signatella* females are characterized by having a deep, undivided atrium with posteriorly directed troughs, posterior lobes which are as high as wide, an atrium eight times wider than long, and openings not visible in ventral view (Figs. 230, 231, 239, 240). *Philoponella signatella* has closely spaced posterior lobes separated by a deep notch (Figs. 239, 240) rather than widely spaced lobes separated by a shallow depression as in *P. tingena* (Figs. 230, 231). Females of *P. signatella* are larger than those of *P. tingena,* having a total length greater than 4.0 mm and a sternum longer than 0.9 mm (Table 4). Anterior epigynal rim about half as long as the epigynal atrium in *P. signatella* (Fig. 239), a fifth as long in *P. tingena* (Fig. 230). Males of *P. signatella* and *P. tingena* are distinguished from others of their species group by the median apophysis bulb's lack of a prominent lobe which, when viewed apically,

Table 5. Web characters of *Philoponella divisa* from the Anchicayá Valley of Colombia (Map 3), *P. tingena*-B from El Queremal, Colombia (Map 3), *P. tingena*-CB from a bamboo patch near Cali, Colombia (Map 3), and *P. republicana* from the Anghicayá Valley of Colombia (Map 3).

		No. RADII	No. SPIRALS		DIAMETER FREE ZONE		DIAMETER CENTER MESH		AVERAGE SPIRAL SPACING			FRAMEWORK	
			MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	UP	DOWN	SIDE	WIDTH	LENGTH
P. divisa					(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(cm)	(cm)
1 singal line	RANGE	19-31	12-33	7-16	26-48	23-48	10-18	7-15	2.3-3.7	2.9-3.8	2.3-3.7	9-22	10-20
no vacant sector	MEAN	22.4	18.6	10.2	34.6	29.6	13.8	11.1	3.1	3.3	3.2	14.5	14.2
N=13	S.D.	3.0	6.1	2.7	6.9	7.0	2.3	2.0	0.5	0.3	0.4	3.2	3.2
P. tingena – B													
1-3 signal lines	RANGE	20-24	15-27	7-12	46-96	41-74	15-24	13-18	4.1-5.6	5.5-8.8	5.1-8.3	15-34	24-45
vacant sector	MEAN	22.3	19.7	9.5	65.4	55.6	18.9	15.0	4.9	7.2	6.6	21.8	34.9
N=6	S.D.	1.4	4.5	2.2	18.7	13.4	3.2	2.2	1.1	1.2	1.5	7.1	9.8
P. tingena – Cb													
1-2 signal lines	RANGE	19-22	20-29	8-10	48-77	39-60	15-24	12-18	3.5-6.8	4.0-4.8	3.5-5.0	11-16	18-21
vacant sector	MEAN	20.5	23.8	9.0	59.9	49.7	18.1	14.8	4.5	4.3	4.1	13.9	19.8
N=4	S.D.	1.3	4.1	0.8	12.5	8.4	4.0	2.5	1.6	0.4	0.7	1.9	1.7
P. republicana - A													
1 signal line no vacant sector		28	26	15	50.4	44.5	21.2	19.7	2.9	4.0	4.3	18.2	22.1

extends along the median surface of the spur's basal region (Fig. 203). *Philoponella signatella* males are larger than those of *P. tingena*, having a carapace length of 1.2 mm or more and a sternum length of 0.7 mm or more. The median apophysis bulb of *P. signatella* is large and somewhat rectangular (Fig. 235); whereas, that of *P. tingena* is smaller and semicircular (Fig. 232).

Description. Female. Total length 4.0 to 6.7 mm ($\bar{X}$ = 5.08, SD = 0.69, N = 29), carapace length 1.2 to 1.8 mm ($\bar{X}$ = 1.59, SD = 0.12), sternum length 0.9 to 1.2 mm ($\bar{X}$ = 1.07, SD = 0.07). Abdomen about twice as long as wide with two low adjacent tubercles in anterior third of dorsum (Fig. 234). Color similar to *U. tingens*, but in dark forms median light area of carapace about half as long as carapace. In light forms this white area extends anteriorly three-quarters the carapace length and the median lobe is twice as long as lateral lobes. Dorsal abdominal pattern as shown in Fig. 234. Epigynal crypt opens posteriorly and has two closely spaced posterior lobes separated by a deep depression (Fig. 239). Atrium's length about one-fifth the epigynum's width and two times the width of the anterior rim. In ventral view epigynal openings obscured by posterior lobes (Fig. 239).

Male. Total length 2.8 to 3.6 mm ($\bar{X}$ = 2.30, SD = 0.33, N = 4), carapace length 1.2 to 1.4 mm ($\bar{X}$ = 1.24, SD = 0.09), sternum length 0.7 to 0.8 mm ($\bar{X}$ = 0.75, SD = 0.04). Carapace light tan with wide, diverging lateral gray lines (Figs. 237). Sternum light tan with gray posterolateral margins. Abdomen's dorsum with numerous white spots and gray posterior tip. Venter with faint gray median area bordered by a few white spots. Legs tan or with faint gray distal rings on tibiae and metatarsi. Median apophysis bulb of the palpus has an average diameter of 0.4 to 0.5 mm ($\bar{X}$ = 0.43, SD = 0.03, N = 4) and is rounded to rectangular in shape (Fig. 235).

Distribution. Honduras through eastern Mexico (Map 3).

Philoponella vicina (O. Pickard-Cambridge), new combination
Figures 241–244

Uloborus vicinus O. Pickard-Cambridge, 1898, Biol. Cent.-Amer., Arachnida-Araneidea, I, 266. Female holotype from Teapa in the Mexican state of Tabasco, collected by H. H. Smith, in the British Museum (Natural History), examined.

Note. This species is known only from the female syntype, upon which the following description is based.

Diagnosis. Females of *P. vicina* can be distinguished from those of *P. tingena* and *P. signatella* by having posterior epigynal lobes which are wider than long, by having laterally rather than posteriorly directed epigynal troughs, by having openings visible in ventral view, and by having an epigynal atrium which is two-thirds rather than one-third the length of the epigynum (Figs. 242, 243). *Philoponella vicina* is distinguished from *P. republicana* by having the epigynal openings in depressions at the center of the epigynum rather than on raised areas in the posterior third, by having an anterior rim one-eighth rather than one-sixteenth the length of the epigynum, by having a total body length less than 4.2 mm, and by having a tan rather than black sternum which is less than 0.8 mm long.

Description. Female. Total length 4.2 mm, carapace length 1.2 mm, sternum length 0.8 mm. Abdomen slightly more than half as wide as long with two small, but distinct humps in anterior quarter (Fig. 241). Carapace dark gray with a wide median light area extending anteriorly almost to the posterior eye row. Sternum tan with gray posterior lateral margins. Dorsum of abdomen with broad, light median area broken only by a gray patch between the humps and a smaller gray patch midway along the abdomen's length (Fig. 241). Sides of abdomen light gray, posterior tip dark gray. Venter of abdomen with a light gray median area. First femur with a distal light ring, second through fourth femora and all tibiae with proximal and median light rings. Metatarsi with a distal gray ring. Epigynal crypt opens laterally and is half as long as wide. Each opening is in a long depression at the anterolateral border of a wide posterior lobe (Fig. 242, 243). Anterior rim about one-fifth the atrium's length. Ducts separated by five of their diameters, each leading first to a bulb with a diameter half that of the spermatheca and then looping before connecting to a spherical spermatheca (Fig. 244).

Distribution. Southern Mexico.

The *Philoponella semiplumosa* Species Group

Philoponella semiplumosa, *P. oweni*, *P. arizonica*, and *P. vittata* belong to this species group. Clypeus height of females equal to AME diameter. Clypeus height of males 1.5 to two AME diameters. Epigynal openings near the center of the atrium and separated by a distance equal to at least 0.8 the atrium's width (Figs.

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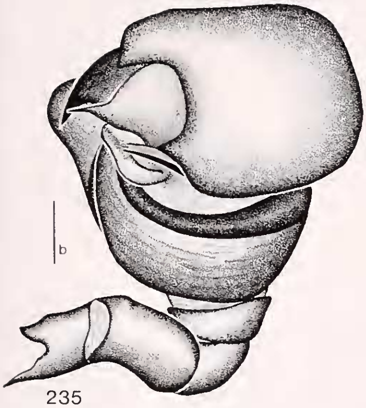
Figures 235–240. *Philoponella signatella* (Roewer). 235. Retrolateral view of male left palpus. 236. Retrolateral view of expanded male left palpus. 237. Dorsal view of male. 238. Lateral view of epigynum. 239. Ventral view of epigynum. 240. Posterior view of epigynum. Figures 241–244. *Philoponella vicina* (O. Pickard-Cambridge). 241. Dorsal view of female. 242. Ventral view of epigynum. 243. Posterior view of epigynum. 244. Dorsal view of cleared epigynum. Figure 245. Apical views of left median apophysis spurs of male palpi of the *Philoponella semiplumosa* species group. Figures 246–247. *Philoponella semiplumosa* (Simon) dorsal views of females.



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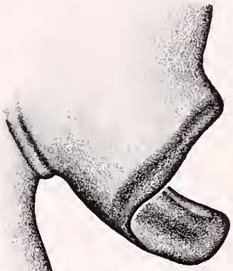

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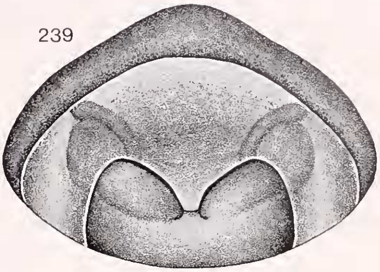

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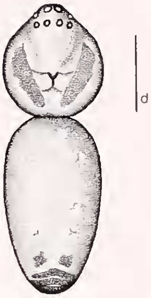

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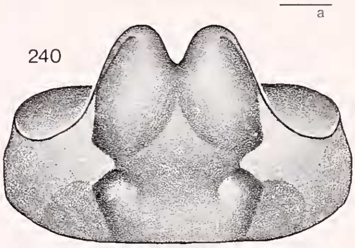

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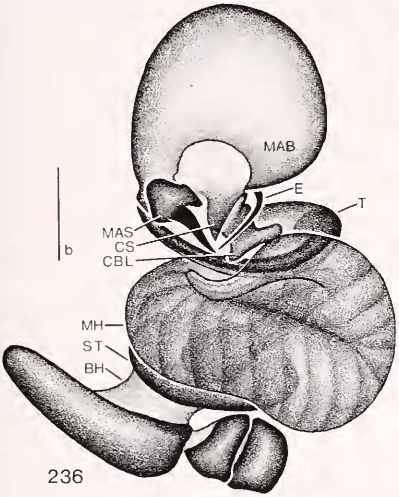

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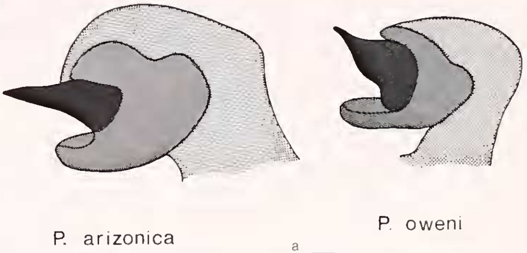

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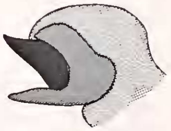
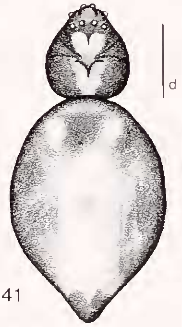


P. variegata



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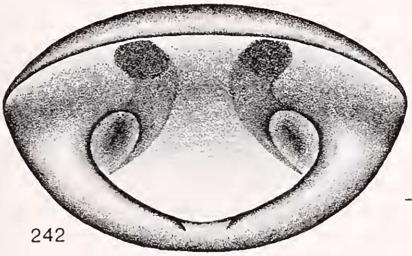

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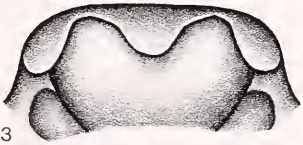

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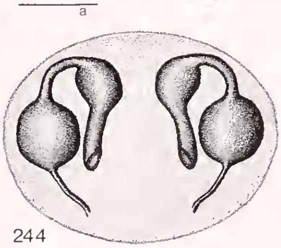

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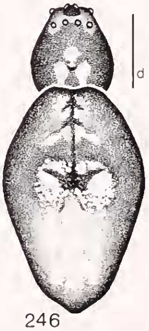

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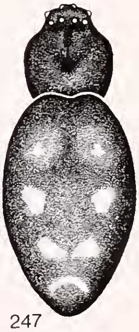

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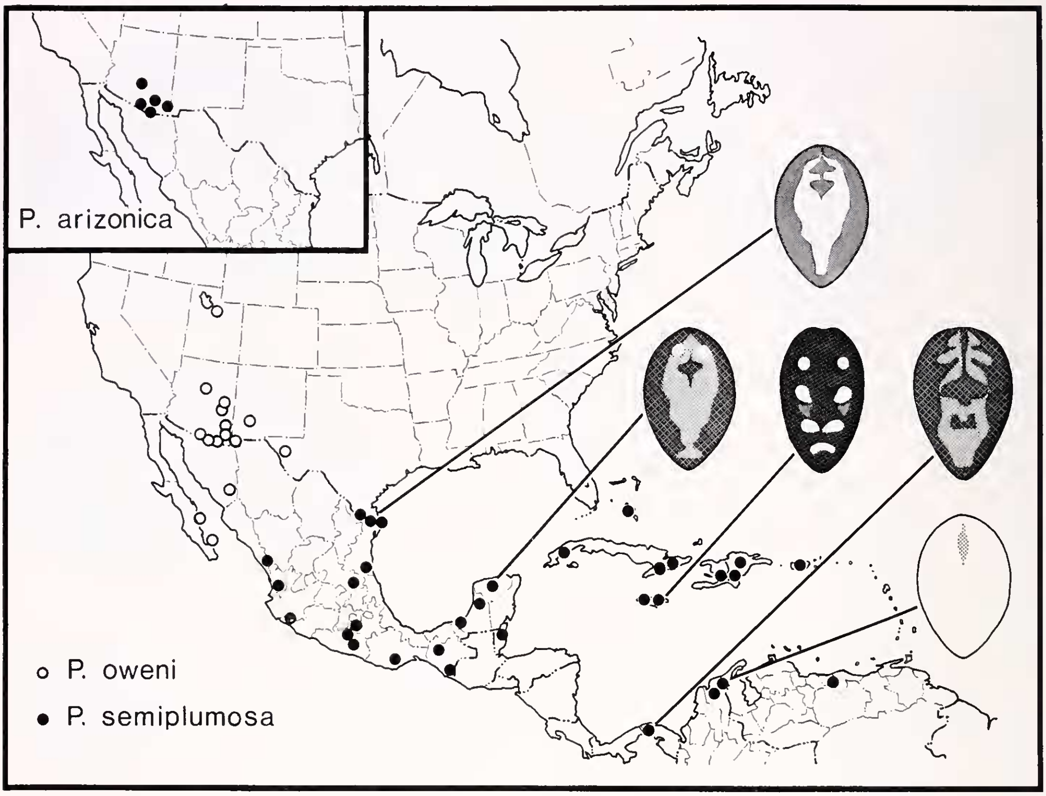


Map 4. Distribution of *Philoponella arizonica, P. oweni,* and *P. semiplumosa.*

250, 259, 266). Anterior and posterior atrial rims contiguous and lateral troughs absent. Anterior rim narrow and precipitous and posterior rim continuous without clearly defined lateral lobes (Figs. 251, 262, 267). Except in *P. vittata* (Fig. 268), each duct spirals tightly around itself before connecting with a spherical spermatheca (Fig. 252). Male palpus' conductor blade elongate and nearly three times as long as wide (Figs. 253, 270). Conductor spike longer than the broad median apophysis spur's apical region (Figs. 253, 270). Median apophysis bulb encompasses the median apophysis spur's basal region along 0.7 of its perimeter (Fig. 245). Retrolateral palpal femoral tubercle longer than prolateral tubercle and its length about equal to its basal width (Fig. 269).

Philoponella semiplumosa (Simon), new combination

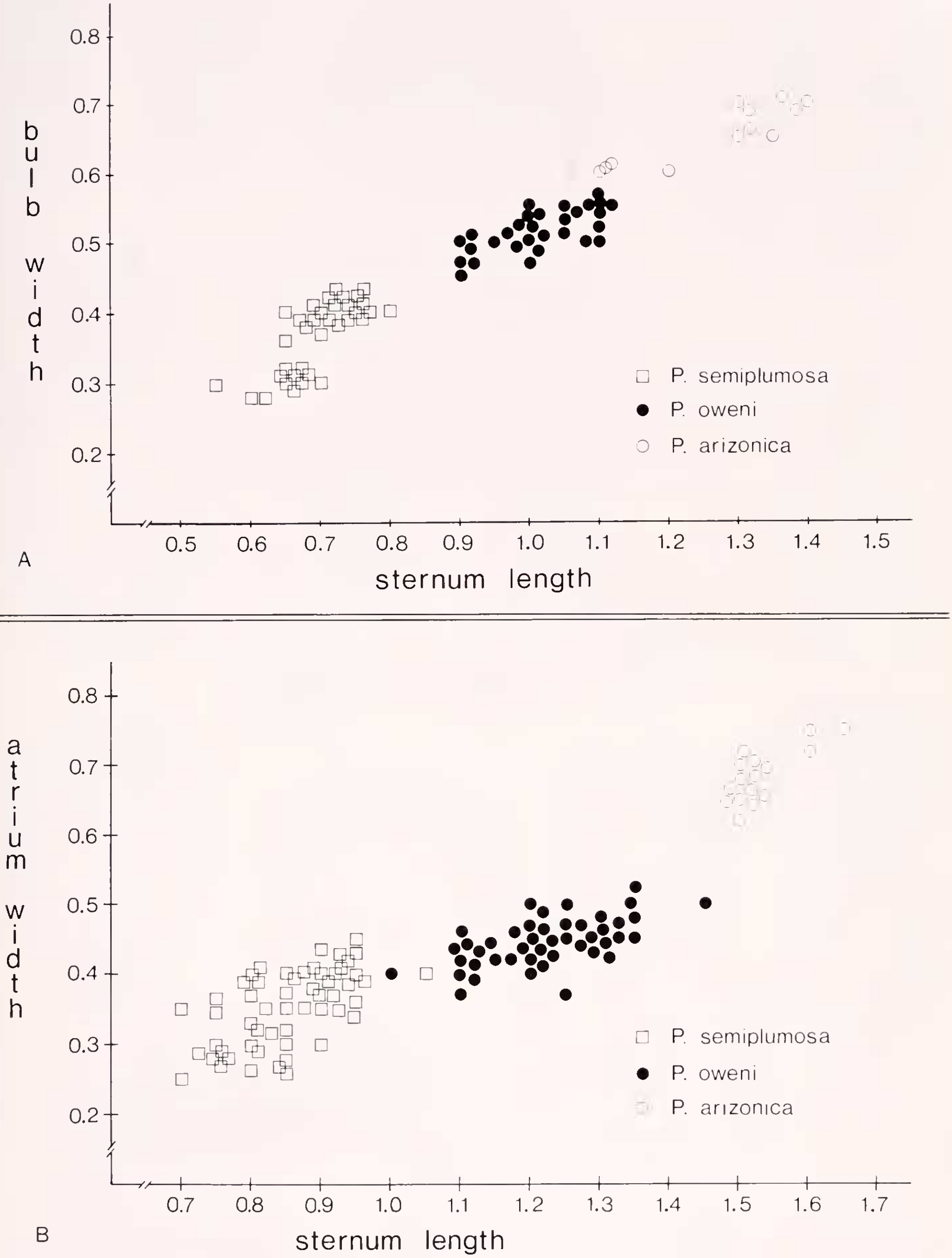
Table 6; Figures 245–254; Map 4

Uloborus semiplumosus Simon, 1893, Ann. Soc. ent. Fr., 61: 424. Three females from Caracas and San Esteban, Venezuela collected 27 December 1887 to 20 January 1888 and 29 February to 27 March 1888, respectively by E. Simon, in Muséum National d'Histoire Naturelle, Paris, examined.

Uloborus variegatus O. Pickard-Cambridge, 1898, Biol. Cent.-Amer., Arachnida-Araneidea, I: 266. Four female and four immature syntypes from Omilteme(i) in the Mexican state of Guerrero, collected by H. H. Smith, in the British Museum (Natural History), examined, NEW SYNONYMY.

Uloborus abstrusus Gertsch and Davis, 1942, Amer. Mus. Novitates, 1158: 18. Male holotype and female allotype from Xilitla in the Mexican state of San Luis Potosí, collected 22 December 1939, female and four immature paratypes from the same

TABLE 6. ANALYSIS OF SPECIES IN THE *PHILOPONELLA SEMIPLUMOSA* SPECIES GROUP.



locality, collected 2 December 1939 by A. M. and L. J. Davis, in the American Museum of Natural History, examined, NEW SYNONYMY.

Diagnosis. Females are similar to those of *P. oweni* and *P. arizonica,* but smaller, having a total length of less than 4.6 mm, a carapace length of less than 1.5 mm, and a sternum length of less than 1.0 mm. In females of *P. semiplumosa* the anterior epigynal rim about as long as the posterior rim (Fig. 250), rather than one-fourth as long (Figs. 257, 259). Internal epigynal ducts usually do not show through the atrium's integument as they do in the other two species. Venter of female's abdomen with narrow (Fig. 249) rather than wide (Fig. 256) paraxial white stripes setting off a median longitudinal gray stripe. Males are similar to those of *P. oweni* and *P. arizonica* but are smaller, having a carapace length of less than 1.4 mm, a sternum length of less than 0.8 mm, and a bulb width of less than 0.4 mm.

Description. Female. Total length 3.6 to 4.6 mm ($\bar{X} = 3.94$, SD = 0.25, N = 37), carapace length 1.1 to 1.5 mm ($\bar{X} = 1.25$, SD = 0.11), sternum length 0.7 to 1.0 mm ($\bar{X} = 0.85$, SD = 0.07). Carapace dark gray with light, trilobed white patch in posterior half or black without light markings (Figs. 246–247). Sternum gray to black. Abdomen with prominent dorsal humps in anterior third. Dorsum light gray with white median area and dark gray sides (Fig. 246) to black with a posterior white chevron and three pairs of white spots (Fig. 247). Venter of abdomen gray to black with narrow paraxial stripes (Fig. 249). Legs brown to gray. First femur with light distal ring, second through fourth femora with light proximal and distal rings (proximal ring may be lacking in darker specimens). Tibiae with light proximal and median rings. First through third metatarsi and tarsi with narrow, light proximal ring, fourth metatarsus with narrow, light proximal and distal rings. Epigynal atrium 0.3 to 0.4 mm wide ($\bar{X} = 0.36$, SD = 0.05, N = 55) and three-fifths as long as wide. Anterior rim of epigynum about as wide as posterior rim (Fig. 250). Epigynum in posterior view with a median depression (Fig. 251).

Male. Total length 2.4 to 3.4 mm ($\bar{X} =$ 2.93, SD = 0.35, N = 25), carapace length 1.0 to 1.4 mm ($\bar{X} = 1.21$, SD = 0.10, N = 30), sternum length 0.6 to 0.8 mm ($\bar{X} =$ 0.70, SD = 0.05, N = 36). Carapace tan with a light median stripe beside which are brown, diverging stripes (Fig. 248). Sternum tan dusted with gray to solid gray in darker specimens. Dorsum of abdomen white with a pair of dark dots in the anterior third (Fig. 248) or, in darker specimens, with three to four dark gray chevrons. Venter of abdomen with a slightly darker median area. Legs tan, first femur reddish brown. The first tibia of most with eight or fewer dorsal spines. Length of central projection of median apophysis about 1.5 times the width of its base (Fig. 253). Bulb 0.3 to 0.4 mm wide ($\bar{X} = 0.37$, SD = 0.05, N = 36).

Distribution. SE Texas through Central American and the Caribbean Islands (Map 4).

Philoponella oweni (Chamberlin), new combination

Table 6; Figures 255–258; Map 4

Uloborus oweni Chamberlin, 1924, Proc. Calif. Acad. Sci., 12(28): 579. Female holotype from Gulf of California, Carmen Island, Marquer Bay, collected 23 May 1921 by J. C. Chamberlin, V. Owen, and I. M. Johnston, in the California Academy of Sciences (specimen No. 1363), examined.

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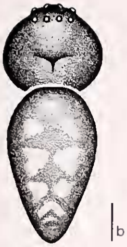
Figures 248–254. *Philoponella semiplumosa* (Simon). 248. Dorsal view of male. 249. Ventral view of female abdomen. 250. Ventral view of epigynum. 251. Posterior view of epigynum. 252. Dorsal view of cleared epigynum. 253. Retrolateral view of left male palpus. 254. Eggsacs. Figures 255–258. *Philoponella oweni* (Chamberlin). 255. Dorsal view of female. 256. Ventral view of female abdomen. 257. Ventral view of epigynum. 258. Dorsal view of male. Figures 259–261. *Philoponella arizonica* (Gertsch). 259. Ventral view of epigynum. 260. Dorsal view of female. 261. Dorsal view of male.



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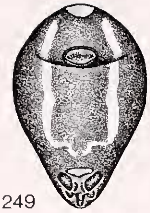

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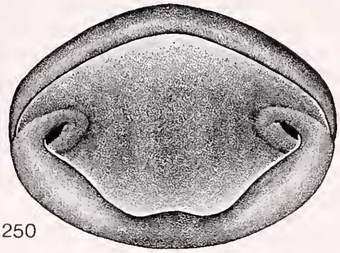

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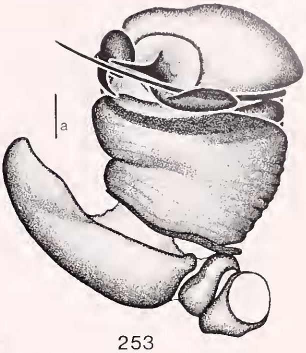

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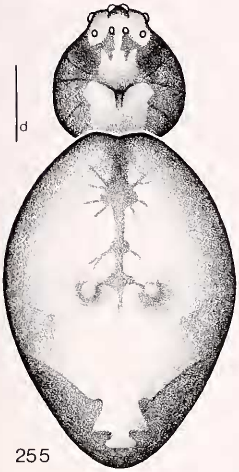

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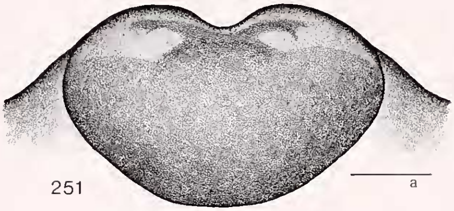

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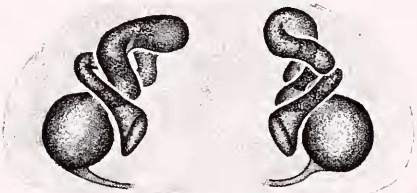

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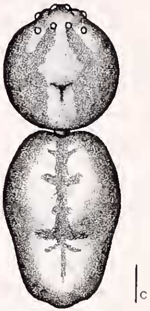

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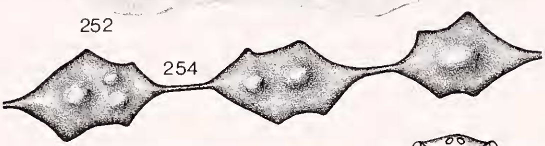

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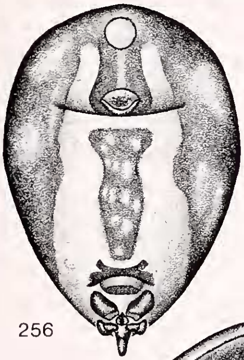

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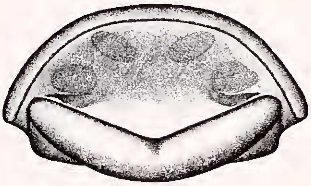

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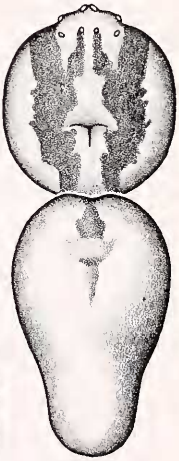

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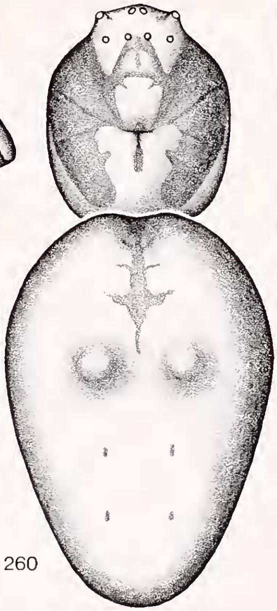

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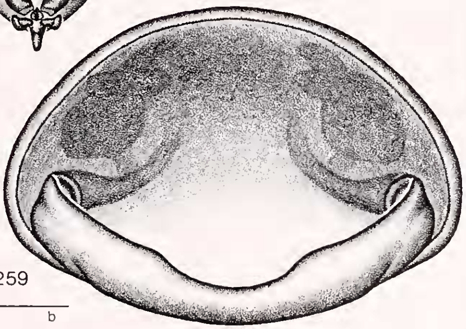

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Muma and Gertsch, 1964, Amer. Mus. Novitates 2196: 34.

Diagnosis. Females are similar to those of *P. semiplumosa* and *P. arizonica*, but are intermediate in size, having a carapace length of 1.5 to 2.0 mm and a sternum length of 1.0 to 1.5 mm. Like *P. arizonica* and unlike *P. semiplumosa*, the anterior epigynal rim is one-fourth as long as, rather than equal in length to, the posterior rim; some of the internal ducts show through the atrium's integument (Fig. 257), and broad, paraxial stripes set off a median gray area on the venter of the abdomen (Fig. 256). Females of *P. oweni* differ from those of *P. arizonica* by being more darkly pigmented, by having an epigynal atrium which is three rather than two times as wide as long (Fig. 257), and by lacking ventral lateral dark lines (Fig. 262) on the posterior face of the epigynum. Males of *P. oweni* are similar to those of *P. semiplumosa* and *P. arizonica* but are intermediate in size, having a carapace length of 1.6 to 1.8 mm, a sternum length of 0.9 to 1.1 mm, and a bulb width of 0.5 to 0.6 mm. *Philoponella oweni* has a median apophysis spine the length of whose central projection is 1.5 the width of its base rather than 2.5 as in *P. arizonica* (Fig. 245).

Description. Female. Total length 4.6 to 7.1 mm ($\bar{X} = 5.81$, SD = 0.69, N = 27), carapace length 1.5 to 2.0 mm ($\bar{X} = 1.82$, SD = 0.17, N = 27), sternum length 1.0 to 1.5 mm ($\bar{X} = 1.21$, SD = 0.10, N = 46). Carapace brown with broad, median light area extending anteriorly to eyes (Fig. 255). Sternum tan at center with gray margins. Abdomen with small humps about midway along its length, dorsum entirely white or with white median area and gray sides (Fig. 255). Venter of abdomen white with narrow gray median longitudinal stripe (Fig. 256). Legs light brown. First femur with distal light ring, second through fourth femora with proximal and distal light rings. Tibiae with proximal and median light rings. First metatarsus without rings, second through fourth metatarsi with faint proximal and distal light rings. Tarsi with light narrow proximal rings. Epigynal atrium 0.4 to 0.5 mm wide ($\bar{X} = 0.46$, SD = 0.05, N = 46) and about two-fifths as long as wide. Anterior rim of epigynum one-fourth the width of posterior rim (Fig. 257). Epigynum in posterior view without a proiment median depression.

Male. Total length 3.2 to 4.4 pm ($\bar{X} = 4.00$, SD = 0.33, N = 14), carapace length 1.6 to 1.8 mm ($\bar{X} = 1.69$, SD = 0.09, N = 14), sternum length 0.9 to 1.1 mm ($\bar{X} = 1.01$, SD = 0.07, N = 30). Carapace brown dusted with gray, light median longitudinal stripe extends anteriorly to eyes (Fig. 258). Sternum with gray margins and tan center. Dorsum of abdomen all white or with a white median area and gray sides (Fig. 258). Venter of abdomen light or with a narrow median gray area set off by broad paraxial white stripes. Legs reddish brown and, in most specimens, with no prominent markings. First tibia of most with nine or ten dorsal macrosetae. Length of central projection of median apophysis about 1.5 the width of its base. Bulb 0.5 to 0.6 mm wide ($\bar{X} = 0.52$, SD = 0.03, N = 30).

Distribution. SW Texas, SW United States, and NW Mexico (Map 4).

Philononella arizonica (Gertsch), new combination

Table 6; Figures 259–263; Map 4

Uloborus arizonicus Gertsch, 1936, Amer. Mus. Novitates, 852: 2. Male holotype from Sabino Basin, Santa Catalina Mountains, Arizona (elevation 1280 m), collected 8 to 12 July 1916 by F. E. Lutz, in the American Museum of Natural History, examined. Muma and Gertsch, 1964, Amer. Mus. Novitates, 2196: 35.

Diagnosis. Males and females are similar to those of *P. oweni* but are usually larger, males being at least 4.0 mm long and females being at least 6.7 mm. Females of *P. arizonica* are more light colored. See *P. oweni* diagnosis for additional distinguishing characters of these two species.

Description. Female. Total length 6.7 to 8.0 mm ($\bar{X}$ = 7.26, SD = 0.50, N = 11), carapace length 2.3 to 3.2 mm ($\bar{X}$ = 2.48, SD = 0.21, N = 16), sternum length 1.5 to 1.7 mm ($\bar{X}$ = 1.52, SD = 0.05, N = 16). Carapace brown with broad, light median longitudinal stripe extending anteriorly to eyes (Fig. 260). Sternum tan, often dusted with gray. Abdomen with small humps in anterior two-fifths, dorsum all white or with light gray sides (Fig. 260). Venter of abdomen all white or with a narrow median gray stripe. Legs light tan with no prominent markings. Epigynal atrium 0.6 to 0.8 mm wide ($\bar{X}$ = 0.68, SD = 0.04, N = 16), and four-sevenths as long as wide (Fig. 259). Anterior rim of epigynum one-fourth the width of the posterior rim. Epigynum in posterior view without a prominent median depression and with ventral lateral dark lines showing through the integument (Fig. 262).

Male. Total length 4.0 to 6.4 mm ($\bar{X}$ = 5.34, SD = 1.03, N = 11), carapace length 2.0 to 3.8 mm ($\bar{X}$ = 2.56, SD = 0.50, N = 11), sternum length 1.1 to 1.4 mm ($\bar{X}$ = 1.27, SD = 0.12, N = 11). Carapace tan with two brown paraxial stripes extending to anterior margin (Fig. 261). Sternum tan, in some dusted with gray. Dorsum of abdomen all white or with gray sides and cardiac area (Fig. 261). Venter of abdomen all white or with narrow gray median longitudinal stripe. Legs tan with no prominent markings. First tibia of most with 12 dorsal macrosetae. Length of central projection of median apophysis about 2.5 times the width of its base. Bulb of median apophysis 0.6 to 0.7 mm wide ($\bar{X}$ = 0.66, SD = 0.04, N = 10).

Distribution. Arizona (Map 4).

Philoponella vittata (Keyserling), new combination
Figures 264–271; Map 5

Uloborus vittatus Keyserling, 1882, Verh. zool.-bot. Ges. Wien, 31: 279. Three female and one male syntypes from Peru, in British Museum (Natural History), examined.

Uloborus servulus Simon, 1892 [1893], Ann. Soc. ent. France, 61: 424. Male, three female, and three immature female syntypes from San Esteban (6 km S of Puerto Cabello) in the Venezuelan state of Caracas, collected 29 February to 27 March by E. Simon, in Muséum National d'Histoire Naturelle, Paris, examined, NEW SYNONYMY.

Uloborus semiargenteus Simon, 1893, Ann. Soc. ent. France, 62: 299. Six female, two male, and five immature syntypes from le Pará (presently Belém), Brazil, collected by M. de Mathan, in Muséum National d'Histoire Naturelle, Paris, examined, NEW SYNONYMY.

Uloborus amazonicus Mello-Leitão, 1949, Boletim do Museu Nacional, Rio de Janeiro, 92: 2. Female holotype from the vicinity of Rio Xingu in northwestern Brazil, collected by J. C. Carvalho, in the Museu Nacional, Rio de Janeiro, examined, NEW SYNONYMY.

Note. Keyserling lists female and male syntypes from "Peru: Amable Maria and Junin" and mentions that numerous examples are in the University of Warsaw collection. These specimens were not received with other requested material from the Polska Akademia Nauk and appear to be lost. Specimens in the British Museum (Natural History) marked "type" appear to be part of Keyserling's type series.

Diagnosis. Females are most similar to those of *P. republicana* and *P. vicina*, but may be distinguished by their color pattern (Fig. 264), by having a broad, convex anterior epigynal border (Fig. 266) rather than a narrow, precipitous margin; by having openings in the posterior sixth rather than posterior third or half of the atrium (Fig. 266), and by having these openings separated by a third the atrial width. Epigynal ducts loop twice before connecting with the spermathecae (Fig. 268). Males are similar to those of the other members of this species group, but may be distinguished by the presence of a light chevron on the abdomen's venter (Fig. 265), by having a median apophysis bulb which is dome-shaped rather than flat in lateral view, and by having a more extensive conductor lobe (Fig. 270).

Description. Female. Total length

4.7 to 6.3 mm (X̄ = 5.29, SD = 0.46, N = 16), carapace length 1.4 to 1.7 mm (X̄ = 1.58, SD = 0.10), sternum length 0.9 to 1.1 m (X̄ = 1.02, SD = 0.07). Carapace uniformly tan to dark brown or with a light central area which may be trilobed (Fig. 264). The AMEs often surrounded by a small, light area, never by a black area. Clypeus height 0.5 to 0.6 AME diameter. Sternum brown to dark gray. Abdomen half as wide as long with a slight raised area in the anterior quarter. Dorsum white to dark gray with a light median longitudinal stripe a third to half the abdomen's width, within which are three pairs of darkly bordered white spots or three medially divided chevrons (Fig. 264). Anterior lateral margins of abdomen each with a white oval patch, posterior tip of abdomen with a white chevron. Abdomen's venter with an hourglass-shaped median light area set off by a narrow white line. Booklung covers unpigmented. Legs uniformly light in color or with dark proximal and distal rings of femora and tibiae. Epigynum with a shallow central depression bordered anteriorly and laterally by broad, convex margins and posteriorly by a narrow, overhanging rim (Fig. 266). Openings in posterior sixth of epigynum, separated by a third the epigynal width. Ducts loop twice before entering spherical spermatheca (Fig. 268).

Male. Total length 3.6 to 4.2 mm (X̄ = 3.91, SD = 0.19, N = 16), carapace length 1.5 to 1.8 mm (X̄ = 1.63, SD = 0.09, sternum length 0.9 to 1.0 mm (X̄ = 0.96, SD = 0.04). Carapace light tan, often with a light median stripe and lateral markings (Fig. 265). All eyes with a narrow black rim. Clypeus height equal to AME diameter. Sternum light tan. Abdomen's dorsum light tan, often with light gray sides, four medially divided white chevrons, and two anterolateral white patches (Fig. 265). Abdominal venter with a gray median longitudinal stripe about half the abdomen's width and with a light chevron midway between the spinnerets and epigastric furrow. Legs all light or faintly colored as in females. Palpal femur with two small, equal-sized proximal ventral tubercles. Median apophysis bulb large and dome-shaped, conductor spike long and conductor blade large, three times as long as wide (Fig. 270).

Distribution. South America (Map 5).

The *Philoponella fasciata* Species Group

This group contains *P. fasciata*, *P. para*, and *P. bella*. Females of these species and males of *P. para* have a clypeus height equal to the AME diameter and male *P. fasciata* a clypeus height twice the AME diameter. Epigynal openings are found in the anterior third (Fig. 287) or posterior half of the atrium (Fig. 275, 284) and are separated by a distance equal to 0.6 to 0.8 the atrial width. The duct leading from each opening coils once (Figs. 275, 285) before connecting to the spermatheca and in the region of this coil its walls are thickened. Anterior epigynal rim precipitous, its anterior border is broad and convex (Figs. 275, 284, 287). Anterior and posterior rims are not separated by conspicuous troughs and the posterior rim is not indented (Figs. 276, 286, 288). The male palpus has a short, square conductor blade, but unlike the other species groups, has a long, thin,

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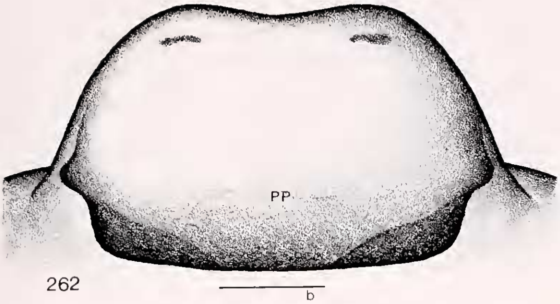
Figures 262–263. *Philoponella arizonica* (Gertsch). 262. Posterior view of epigynum. 263. Dorsal view of cleared epigynum. Figures 264–271. *Philoponella vittata* (Keyserling). 264. Dorsal view of female. 265. Dorsal view of male. 266. Ventral view of epigynum. 267. Posterior view of epigynum. 268. Dorsal view of cleared epigynum. 269. Ventral view of male palpal femur. 270. Retrolateral view of male left palpus. 271. Apical view of left male palpus. Figure 272. Apical views of male left median apophysis spurs of *Philoponella fasciata* species group. Figures 273–274. *Philoponella fasciata* (Mello-Leitão). 273. Female carapace. 274. Dorsal view of female holotype abdomen.



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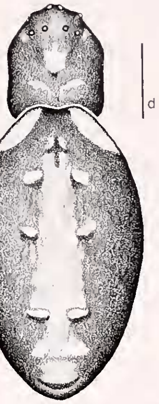

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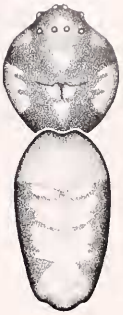

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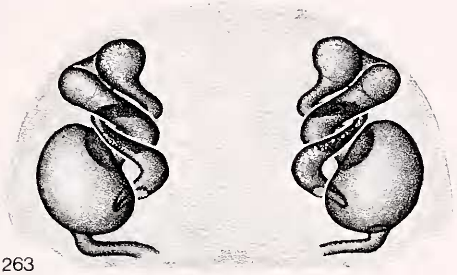

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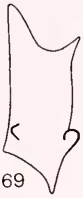

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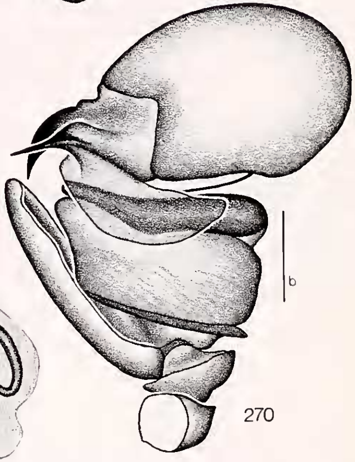

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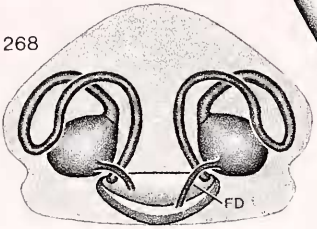

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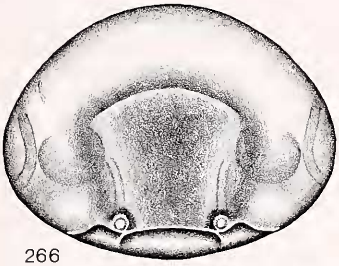

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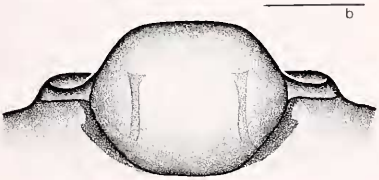

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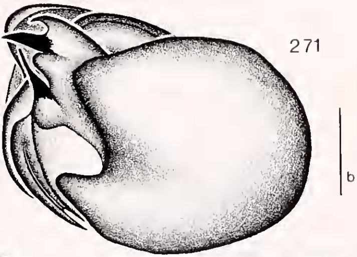

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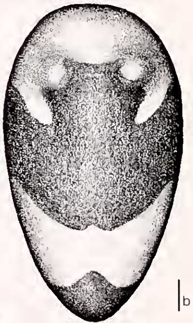

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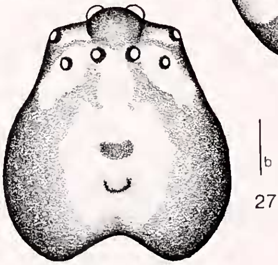

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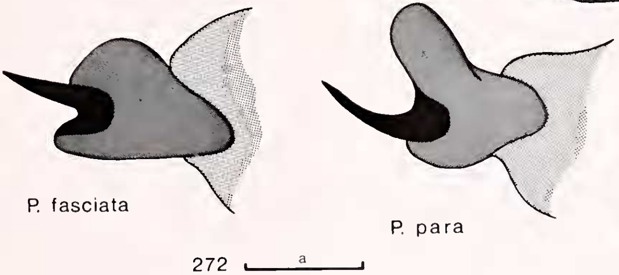

P. fasciata

P. para

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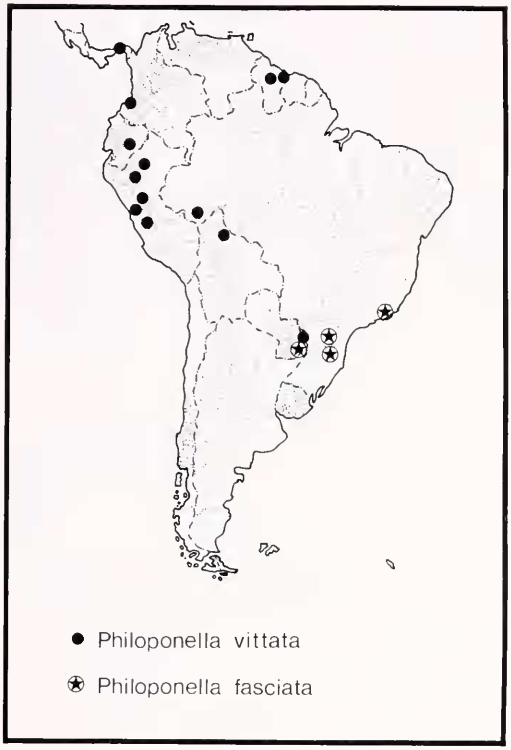

Map. 5. Distribution of *Philoponella vittata* and *P. fasciata*.

distal prong which runs nearly parallel to the conductor spike (Figs. 280, 283). The conductor spike is as long as or longer than the median apophysis spur's slender apical region.

Philoponella fasciata (Mello-Leitão), new combination
Figures 272–281; Map 5

Uloborus fasciatus Mello-Leitão, 1917, Esc. Sup. Agric. Medic. Vet., 1(1): 4. Female holotype from Nova-Iguaeú in the Brazilian state of Rio de Janeiro, collected by Blanc de Freitas, in Museu Nacional, Rio de Janeiro, examined.

Diagnosis. Females are distinguished from other members of the *variegata* species group by having: 1. a total length of less than 3.5 mm, 2. a sternum length of 0.7 mm or less, 3. long, longitudinal epigynal openings located in the posterior half of the epigynal crypt and bordered laterally by a broad, flat inclined region (Fig. 275), and 4. a gray spot just anterior to the carapace's thoracic depression. Males are distinguished from others of the genus by their high, nearly cylindrical carapace (Figs. 278, 279), long lateral palpal femoral tubercle (Fig. 281), and coloration (Figs. 278, 279). They are distinguished from other members of the *variegata* species group by their short basal conductor lobe and its long, thin extension (Fig. 280).

Description. Female. Total length 2.4 to 3.2 mm ($\bar{X}$ = 2.76, SD = 0.30, N = 10), carapace length 1.0 to 1.1 mm ($\bar{X}$ = 1.00, SD = 0.05), sternum length 0.6 to 0.7 mm ($\bar{X}$ = 0.64, SD = 0.04). Abdomen three-fourths as wide and high as long and peaked in the anterior third of its length. Carapace light tan to black, all but the darkest specimens having color markings similar to those shown in Fig. 273. Sternum tan to dark brown. Abdomen coloration of holotype (Fig. 274) differs from that of other specimens examined. In these it ranges from white to black, but in most specimens has a wide white dorsomedian stripe, gray sides, and a gray venter with a pair of thin, widely separated paraxial stripes extending from booklungs to spinnerets. In ventral view epigynal atrium is 0.1 to 0.2 mm long ($\bar{X}$ = 0.15, SD = 0.02) and 0.2 to 0.3 mm wide ($\bar{X}$ = 0.26, SD = 0.02). Its long openings lie just posterior to the atrium's center, medial to wide lateral borders, and sep-

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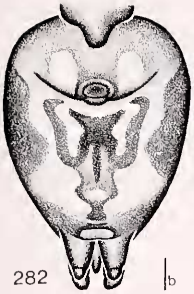
Figures 275–281. *Philoponella fasciata* (Mello-Leitão). 275. Ventral view of holotype's epigynum. 276. Posterior view of epigynum. 277. Dorsal view of cleared epigynum. 278. Dorsal view of male carapace. 279. Lateral view of male carapace. 280. Retrolateral view of apical region of male left palpus. 281. Retrolateral view of male left palpal femur. Figures 282–286. *Philoponella para* n. sp. 282. Ventral view of female abdomen. 283. Retrolateral view of male palpus. 284. Ventral view of epigynum. 285. Dorsal view of cleared epigynum. 286. Posterior view of epigynum. Figures 287–288. *Philoponella bella* n. sp. 287. Ventral view of epigynum. 288. Posterior view of epigynum.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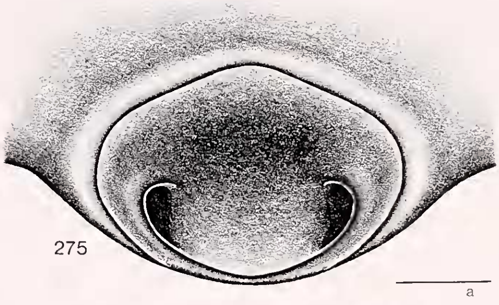
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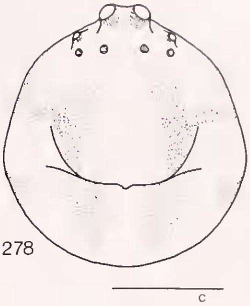
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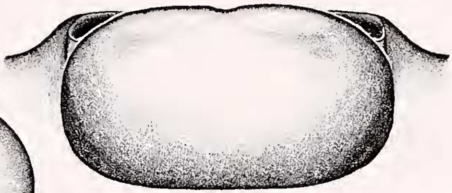
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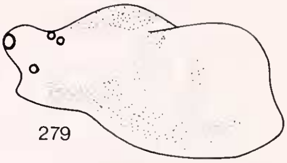
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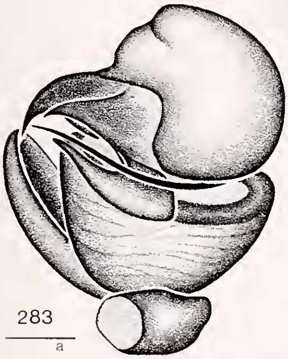
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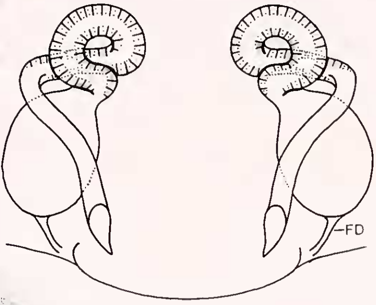
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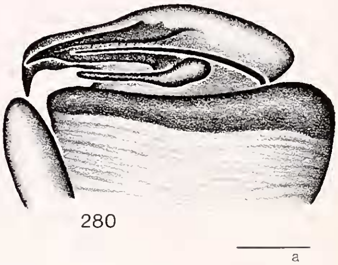
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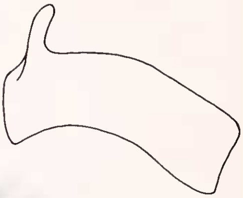
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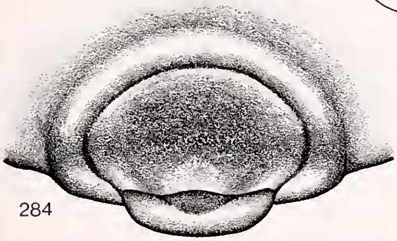
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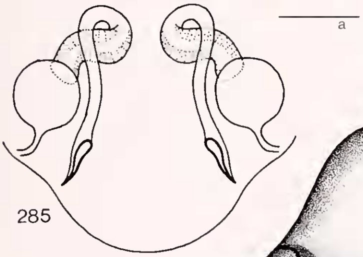
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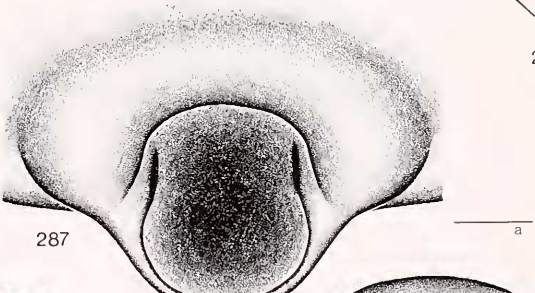
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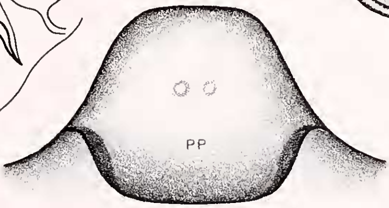
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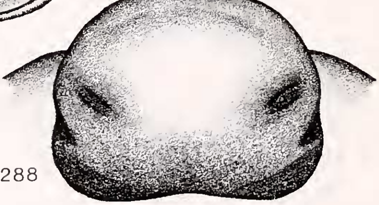
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arated by a distance equal to 0.8 the atrium's width (Fig. 275). In posterior view posterior plate twice as wide as high and with a slight median indentation (Fig. 276). A duct leading from each opening loops once around itself before connecting with a spherical spermatheca (Fig. 277).

Male. The male of this species is described here for the first time. Total length 2.2 to 2.6 mm, carapace length 1.1 to 1.3 mm, sternum length 0.6 to 0.7 mm. Carapace high with nearly straight sides, a deep and wide transverse thoracic groove, and a more prominent AME tubercle than present in other *Philoponella* males (Figs. 278, 279). Length of retrolateral palpal femoral tubercle twice the width of its base (Fig. 281). First femur with two or three prolateral, one retrolateral, one dorsal, and no ventral macrosetae. First tibial prolateral, retrolateral, and dorsal surfaces each with four spines, venter without spines. Carapace tan to black and in most specimens with color markings similar to those shown in Figs. 278, 279. Sternum tan to gray. Abdomen tan with irregular white spots and a gray posterodorsal tip. Median apophysis bulb very flat (Fig. 280), 0.3 mm long and 0.2 to 0.3 mm wide. Conductor spur long and concave (Fig. 280). Conductor basal lobe shorter than other known members of the *variegata* species group and with a long, thin, nearly transparent projection which extends parallel to the conductor spur and is about as long as the latter (Fig. 280).

Distribution. Southeastern Brazil and Paraguay (Map 5).

Philoponella para n. sp.
Figures 282–286

Types. Female holotype, one male and two female paratypes from Taguaraiapa [cannot be located in gazeteteers] in the Paraguay department of Alto Paraná, in the American Museum of Natural History. The specific epithet is an arbitrary combination of letters.

Diagnosis. Females are distinguished by having a posterior epigynal margin which protrudes conspicuously ventrally and in posterior view is as high as broad (Figs. 284, 286). The atrium is twice as wide as long and openings situated in its posterior quarter are hidden in ventral view (Fig. 284). The abdomen's light venter has a dark W-shaped mark (Fig. 282). Males of *P. para* and *P. fasciata* are characterized by having a small conductor lobe with a long, thin extension projecting nearly parallel to the conductor spike (Figs. 280, 283). The median apophysis bulb of *P. para* is dome-shaped and has a small apical lobe (Fig. 283); whereas the bulb of *P. fasciata* males is flat (Fig. 280).

Description. Female. Total length 2.4 to 2.8 mm, carapace length 0.9 to 1.0 mm, sternum length 0.7 mm. Carapace and sternum mottled gray. Abdomen width and height two-thirds its length. Abdominal dorsum white with irregular patches of gray, lateral surface white to gray, venter white with a more or less distinct, upright gray "W" (Fig. 282). Legs white. First and fourth femora with proximal, central and distal gray rings; second and third femora with median and distal gray rings. First tibia with proximal and distal gray rings; first metatarsus and tarsus gray. Second through fourth tibiae and metatarsi with median and distal gray rings. Second through fourth tarsi white. In ventral view epigynal atrium about twice as wide as long (length 0.1 mm, width 0.2 mm) and has a concave, ventrally directed median lobe which is three-fourths as wide as the atrium and has a straight ventral margin (Fig. 284). The epigynal atrium's anterior rim is rounded (Fig. 284). In posterior view the epigynum is as high as wide (Fig. 286). An indistinct epigynal opening is located at each centrolateral margin of the atrium and the duct leading from it loops once before connecting to a small spherical spermatheca which lies at the level of the anterior atrial rim (Fig. 285).

Male. Total length 2.2 mm, carapace length 1.0 mm, sternum length 0.6 mm. Carapace and sternum light tan; lateral regions of carapace lightly mottled with gray; sternum with narrow gray lateral borders. Abdomen tan, overlain with white patches; dorsal tip gray, venter with two widely separated, paraxial gray stripes. Legs tan with a faint, distal gray ring on first femur. First femur with three prolateral, one retrolateral, and no dorsal and ventral macrosetae. First tibia with three prolateral, four retrolateral, four dorsal and no ventral spines. Proximal, ventral surface of palpal femur with two small, nearly equal-sized tubercles. Median apophysis bulb dome-shaped, 0.2 mm long, and 0.2 mm wide, and with a small apical lobe (Fig. 283). Median apophysis spur's basal region two-thirds as long as wide, with a prominent apical lobe and a spike equal to the latter's length (Fig. 272). Conductor's basal lobe (Fig. 283) longer than that of *P. fasciata*. Like *P. fasciata*, the basal conductor lobe has an extension which runs nearly parallel to the conductor spike. In *P. para* this extension is about two-thirds the spike's length.

Distribution. Known only from the type locality in Paraguay.

Philoponella bella n. sp.
Figures 287–288

Types. Female holotype and female paratype from Río Domachui trail, elev. 2700 to 3000 m, near Santa Marta in the Colombian state of Magdalena, collected 2 February 1973 by J. A. Kochalka, in the Museum of Comparative Zoology. The specific epithet is an arbitrary combination of letters.

Diagnosis. Female *P. bella* are distinguished from other members of the genus by having an epigynal atrium whose length and width are equal and whose protruding posterior surface has two lateral grooves (Figs. 287, 288).

Description. Only females are known. Total length 3.5 to 3.6 mm, carapace length 1.3 to 1.4 mm, sternum length 0.8 mm. Carapace and sternum mottled gray; carapace with white lateral rim. Abdomen tan, mottled with dark gray and with a pair of large dark dorsal spots in the anterior quarter and a cluster of five narrow, transverse, gray dorsal stripes in the posterior third. First femur gray with a distal white ring. Second through fourth femora white, each with a proximal, central, and distal gray ring. Proximal half of tibiae white with a gray ring, distal half gray-brown. Metatarsi white with dark central and distal rings. Tarsi white proximally and gray distally. In ventral view length and width of epigynal atrium are equal; half of the atrium's length projecting posterior to the epigastric furrow (Fig. 287). The atrium's posterior region forms a deep pocket and is bordered by a thin posterior rim. Openings are situated slightly anterior to the rim's center at the atrium's lateral margins. In posterior view the epigynum has two lateral grooves (Fig. 288). From each epigynal opening a duct loops once before connecting with a small, spherical spermatheca from whose posterior median surface a fertilization duct arises.

Distribution. Known only from the type locality in northeastern Colombia.

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